PLANNING FOR AN OPTIMAL AND EQUITABLE REGIONAL DISTRIBUTION OF CURATIVE HEALTH FACILITIES, WITH SPECIAL REFERENCE TO THE BLUE NILE PROVINCE OF THE SUDAN.

BY

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VOLUME I

DECLARATION

I, the undersigned, hereby declare that this thesis has been composed by myself and that it is my own work.

Signed:

OMER MOHAMED AHMED SALIM

SUMMARY

In most developing countries, the provision of medical care must contend with two extreme conditions - very high medical needs and very few medical care resources to meet them. Under such conditions, planning for optimal provision and equitable distribution of curative facilities requires a thorough understanding of two closely related issues - people's needs for curative care and the relative demands they make on the available curative facilities. In this dissertation, two main questions are considered:-

1. Why do people differ in their needs for medical care? and
2. Why, in the presence of definite needs, do people differ in their demands for the appropriate curative facilities?

The thesis is that medical needs can be explained by a conceptual model depicting the causal relationships that exist between various components of the environmental setting, physical and social, in which the people live, and symptomatic ill-health as a measure of need for curative care. Furthermore, demands for curative facilities can be explained by another conceptual model of predisposing components (reflecting medically defined needs) and enabling components (reflecting the impact of various environmental factors, physical and social, which induce need to be expressed in effective demands for the various levels of curative facilities). Moreover, the relative

importance of respective need components as well as of demand components will vary according to the level of curative facilities concerned.

The exploration of these factors and the understanding of their underlying relationships to need and demand are considered to be basic for the formulation and implementation of policies which aim at optimal provision and equitable distribution of regional curative facilities.

The data for this study are obtained from a regional health survey conducted by the researcher in 1972 in the Blue Nile Province of the Sudan.

Before the analysis of these data, the dissertation attempts to examine, theoretically, the factors determining three main aspects of curative care provision in relation to developing countries: (i) health care resources and policy determinants, (ii) hospital care determinants and (iii) patient determinants. In the light of these determinants, the dissertation further examines some of the methods currently used in planning for the distribution of curative facilities, mostly in developed countries, and highlights their shortcomings in meeting the conditions necessary for an optimal and equitable distribution of curative facilities, especially in developing countries.

The analytical study starts by the development of two conceptual models based on the earlier theoretical discussions, namely the need model and the demand model. Applying these models to the regional survey data, separate analyses of households' needs and demands for various levels of curative care are made. Correlation and one-way analysis of variance techniques are incorporated into the statistical analysis.

The findings of the need analyses generally support the hypothesis that a household's need for primary, intermediate and secondary curative care in a region is a function of its demographic composition, its socio-economic structure, its micro-environmental condition and its macro-environmental setting. The findings also support the hypothesis that the explanatory components vary in their contribution to the total explanation of each level of need, and that the macro-environmental component, in particular, is the most important of all the explanatory components. The findings also support the hypothesis that the relative contribution of each of the four components varies according to the type of need considered. The findings also support the hypothesis that the need model is more successful in explaining the need for primary care than the needs for either intermediate or secondary care as the latter constitute only partial needs.

On the other hand, the findings of the demand analyses generally support the hypothesis that a household's total demand for curative facilities in a region is a function of the predisposing need components and enabling demographic, socio-economic, macro-environmental and physical accessibility characteristics. These findings also support the hypothesis that the explanatory components vary in their contribution to the explanation of total demand, but the predisposing need component is more important than any of the enabling components. These findings also support the hypothesis that the relative contribution of each component varies according to the type of curative care demanded. The relative contribution of the predisposing need component is greatest in the case of demand for primary care institutions while the relative contribution of the enabling components is greatest in the case of demand for either intermediate or secondary care institutions. Also, the relative contribution of the enabling physical accessibility component is greatest in the case of demand for secondary care institutions. Also, the relative contribution of the socio-economic component is least in the case of demand for each of the three types of curative institution. These findings also support the hypothesis that the explanatory power of the demand model fluctuates slightly from one type of demand to the other, but in general the model is more successful in explaining the demand for primary care institutions than the demand for either intermediate or secondary care institutions, particularly as the latter are less abundant in the region studied.

Consideration is given to the implications of the findings for the formulation of policies aimed at achieving both optimal provision of curative care and equitable distribution of curative facilities in the region. The indicated policies fall into the following categories:-

1. Policies to reduce the effects of the demographic composition on both need and demand for curative

care.

2. Policies to reduce the effects of the socio-economic structure on both need and demand for curative care.
3. Policies to reduce the effects of the micro-environmental conditions on need for curative care.
4. Policies to reduce the effects of the macro-environmental setting on both need and demand for curative care.
5. Policies to reduce the effects of the physical accessibility on demand for curative care.

Under each of these categories, various policy guide lines within the context of the findings of the two analytical models are suggested.

In essence, this thesis demonstrates that a policy in planning for an optimal and equitable regional distribution of curative facilities, particularly in the Blue Nile Province of the Sudan, cannot be achieved unless it is conceived within the framework of a comprehensive policy system incorporating both economic and social policy sub-systems.

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INTRODUCTION

INTRODUCTION

In recent years, the application of quantitative techniques to the study of various aspects of medical care has increased. These techniques have been used to supplement the subjective knowledge of the factors affecting the supply and distribution of medical care facilities and the relative importance of these factors. In the field of curative medicine, demands rather than needs have been adopted as the reliable basis for formulating planning policies on the assessment of future medical resources required and their distribution. As a result of this, there has been growing concern that needs, as medically defined, are not satisfactorily catered for, and consequently, the assessment of future resources required is inaccurate and leads to sub-optimal service to the community. It is asserted that, while some people receive considerably less medical care both in quantity and quality than is warranted by their health state, others receive far more of it than is justifiable.[(1)]

The fundamental problems considered in this study are why people differ in their needs for curative care; and why, in the presence of symptomatic health complaints, people differ in their demands for the appropriate curative facilities. The answers to these different but related questions constitute the core of this dissertation. The thesis proposal is:-

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(1) Strous, A. (1967), "Medical Ghettos", Transaction 4, 7.

> that medical needs can be explained by a conceptual model depicting the causal relationships that exist between various components of the environmental setting, physical and social, in which the people live, and symptomatic ill-health as a measure of need for curative care. Furthermore, demands for curative facilities can be explained by another conceptual model of predisposing components (reflecting medically defined needs) and enabling components (reflecting the impact of various environmental factors, physical and social, which induce need to be expressed in effective demand for the various levels of curative facilities). Moreover, the relative importance of respective need components as well as of demand components will vary according to the level of the curative facilities concerned.

An understanding of the relationships and the importance of factors that constrain health and those that promote the translation of need into demand for the appropriate curative facilities, is considered to be crucial both for establishing a sound basis on which future curative provision can be assessed and for achieving an equitable distribution of curative facilities.

The data for this study are obtained from a regional health survey conducted by the researcher in 1972 in the Blue Nile Province of the Sudan. The survey furnishes detailed information on the state of health and the extent of demand made on existing curative facilities by a sample drawn from the whole region. It also furnishes detailed information on the related environmental settings that were assumed to be important in influencing needs and demands for curative facilities. This information was secured both through direct interviews with the members of the selected households, administrators and experts on various fields, and through direct observations during the interviews.[1]

An underlying assumption of this study is that the assessment of future curative facilities as well as their distribution depends on resolving the complex relationships of factors that determine the need and demand for these curative facilities. To go beyond simple description of need patterns and resulting demands - to begin to understand how and why such needs and demands are created and determined - requires the development of a theoretical framework. Relevant theoretical considerations are reviewed in the subsequent three chapters dealing with various influnces that determine the allocation of health care resources, the quantity and quality of medical care, and the need and demand for it. The chapter that follows the theoretical discussions is intended to pin-point certain short-comings of current methodologies used in planning for the distribution and assessment of future curative facilities. An appreciation of these short-comings is of vital importance to the development of the methodology that will be followed in the subsequent chapters in this study.

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(1) Details of the characteristics of the selected households of the study region as well as the sampling and the conduct of the survey will be discussed later in the text.

PLANNING FOR AN OPTIMAL AND EQUITABLE REGIONAL DISTRIBUTION OF CURATIVE HEALTH FACILITIES, WITH SPECIAL REFERENCE TO THE BLUE NILE PROVINCE OF THE SUDAN.

CHAPTER 1

HEALTH CARE RESOURCES AND POLICY DETERMINANTS.

CONTENTS

1.0.0 HEALTH CARE RESOURCES AND POLICY DETERMINANTS

The distribution of medical care is influenced by many factors. Important amongst these are those that are related to resource limitations and to policy for resource allocation. In this chapter these factors will be discussed under the two main headings, i.e. resource limitations and policy conceptualization. While the first set of influences determines the gap between the desirable and the possible in the field of medical provision, the second set of influences provides the principles through which the effects of such a shortfall can be modified by equitable distribution. An understanding of these influences will be helpful both in judging the validity of current methods employed in planning for the distribution of medical care and also in paving the way towards a better understanding of the medical care distributional objective which this study intends to clarify.

1.1.0 RESOURCE LIMITATIONS

1.1.1 Economic and Social Developments

Since the late 19th century, but particularly in the last few decades, governments have assumed increasing responsibility for the promotion of social welfare and simultaneously for the development of the national economy. This is evident in the remarkable expansion after the second world war both of social programmes - often embodied in principle in new national constitutions[1] - and economic development plans. This simultaneous preoccupation with social measures and economic projects created an inevitable competition for funds and raised differing opinions regarding priorities. The importance of "balanced" and "integrated" social and economic developments has been emphasized by many individuals in professional circles, but in view of the lack of an overall theory of growth, this balance has raised considerable controversy.

From a governmental point of view, the question of balanced social and economic development is to an important extent a question of the pattern of public expenditure. In most of the developing countries, public expenditures lack the overall conception. The patterns of expenditures are mainly influenced by fragments of theory and "common sense". One difficulty with common sense is that it rarely transcends the bounds of professional interests. As a result, the recommendations for development reflect the professional composition of the boards or committees entrusted with the job of planning. Each representative of a professional field tends to consider his own field most important for development, and consequently urges heavy investment in projects in that field: Table 1 - 1 shows percentage estimates of government expenditures in certain developing countries. It reflects the diversity of resource allocation.

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(1) United Nations. (1955) International Survey of Programmes of Social Development. Publication No.55.IV.8,p.3.

TABLE 1 - 1

ESTIMATED GOVERNMENT EXPENDITURES FOR SOCIAL PURPOSES IN CERTAIN DEVELOPING COUNTRIES EXPRESSED IN TERMS OF PERCENTAGES (ABOUT 1958) OF GOVERNMENT EXPENDITURE.

SOURCE: United Nations (1961). Report on World Social Situation. Publication No.61.IV.4. New York.

Country	Education	Health	All Social Items
Belgian Congo	14.4	9.9	31.7
Burma	7.6	2.5	15.0
India	9.0	4.0	14.5
Kenya	13.7	5.0	26.4
Nigeria	-	-	34.7
Tanganyika	19.5	8.7	30.7
Uganda	17.9	10.2	37.1
Rep. of Viet-Nam	8.3	4.7	16.2
Ceylon	13.3	-	33.3
Colombia	5.6	3.5	14.0
Equador	12.4	3.7	21.3
Ghana	13.9	6.2	28.4
Honduras	12.6	8.6	26.5
Rep. of Korea	16.2	1.0	22.2
Peru	12.9	3.5	23.3
Phillippines	23.8	6.7	33.1
Thailand	17.4	3.0	25.8
Chile	19.5	20.3	41.3
Costa Rica	24.2	2.7	41.4
El Salvador	14.2	-	28.2
Malaya	17.4	7.4	27.2
Singapore	24.6	14.3	45.5

The diversity characterizing government expenditures among various items also characterizes the distribution of social and economic resources among the various regions within each country in the developing world. For example in the field of health, while the overall ratio of doctor to population in Kenya is 1:10,000, in the rural area the ratio is as high as 1:50,000. Also, while in Nigeria the overall ratio of doctor to population is 1:33,000, the northern region has a ratio of 1:140,000.

Although the question of regional variation in economic and social developments is a worldwide problem, its magnitude is greatly augmented in the developing world, unjustifiably. With respect to social resources the allocation of which involves the notion of social justice, the distribution of such resources is greatly influenced by historical accident, power politics and misconceptions regarding the relationship between economic and social planning. This state of affairs has greatly hampered the effectiveness of social development projects and programmes, and indirectly affected economic growth.

Similarly, the allocation of social resources between various areas of one region is plagued by similar unjustifiable biases.

The health service is particularly important in the developing world. Its importance is not only related to the preservation of human life and the relief of human suffering from disease which is predominant in these areas, but also related to economic development. Improvement in health contributes to economic development by upgrading the human capital and increasing productivity. Professor Malenbaum(1) has demonstrated that there is a very strong positive relationship between productivity and improved health in developing countries.

Health services can broadly be divided into three parts, namely curative, preventive and rehabilitative. Wihtout understating the importance of both the preventive and the rehabilitative types which have recently been gaining more importance, the curative type has been and still is claiming a large share of the development budgets in most developing countries.

This dissertation is intended to offer some contribution to the understanding of the factors that influence the regional distribution of curative facilities within the context of a developing country.

1.1.2 Medical Care

The term "Medical Care" emerged in North America in connection with the Health Insurance Plans. In the United Kingdom it was associated with the National Health Service. However, only recently it has emerged as a separate entity. It has been defined as the study of how fundamental knowledge embodied in medicine and public health can best be applied to the community. Although the term does not convey more than an idea of a comprehensive look towards all the ingredients of

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(1) Malenbaum, Wilfred. (1970) "Health and Productivity in Poor Areas". Empirical Studies in Health Economics: ed. Herbert E. Klarman with the assistance of Helen H. Jazi. Baltimore and London: John Hopkins Press.

medical science, Palmer[1] has summarized how such a desirable objective can be achieved in four points:-

1. Optimum availability and quality of medical care including disease prevention and use of all advances in medical science;
2. Optimum attitudes towards medical care with the elimination of psychological barriers;
3. Optimum ability of the population to procure medical services through absence of constraining barriers;
4. Optimum utilization with complete coordination and integration of facilities and the consequent avoidance of unnecessary hospital care.

Although Palmer's four guiding principles outline the steps towards the attainment of an ideal medical care distribution, the achievement of such a target poses far too many problems. The magnitude of such problems in developing countries greatly exceeds those experienced in affluent societies. The high level of availability of medical care resources, the more rational attitude of the people towards modern medicine, the higher standard of living, the high level of accessibility to places of care and the more developed sense of coordination of the medical care system in developed countries make the problems of implementation much easier than in the case of developing countries. The greater problems in these countries are largely related to the limitation of medical care resources in relation

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(1) Palmer, J. (1956). Measuring Bed Needs for General Hospitals. New York: U.S. Department of Health, Education and Welfare.

to the extremely poor overall health of the population.

1.1.3 Medical Care Resources

The primary ingredients of a modern medical care system are doctors and nurses in addition to financial resources to build hospitals, acquire diagnostic and therapeutic equipments, to pay staff salaries and to purchase drugs. Such resources are much more scarce in developing than in developed countries. Table 1 - 2 and 1 - 3 show the distribution of doctors, nurses as well as hospital beds in some developed and developing countries. It will be seen that, while all the developed countries shown have one doctor to serve at most 900 of their populations, developing countries have one doctor to serve between 3,000 - 90,000 of their populations. Regarding nursing staff, while the great majority of the developed countries shown have one nurse to serve less than 500 of their population, the majority of the developing countries shown have one nurse to serve between 3,000 and 25,000 of their population. As far as the number of hospital beds available for treatment and even without regard to the differences in quality of the beds, any developed country has at least ten times as many beds as those in any developing country. Expenditure in total medical care resources per member of population in a developed country is about ten times that of a developing country.

(Average figures range between US dollars 30 - 40 per person in developed countries, and between US dollars

TABLE 1 - 2

MEDICAL CARE RESOURCES IN CERTAIN DEVELOPED COUNTRIES IN 1966.

SOURCE: United Nations (1969/70). World Economic Survey. Publication No.E.71.II.C.1.

Country	Population per Physician	Population per Nurse	Population per Hospital Bed
France	800	400	120
West Germany	600	400	90
Sweden	900	300	70
United Kingdom	900	500	100
Netherlands	900	800	200
U.S.A.	700	200	120
U.S.S.R.	500	300	100
Czechoslovakia	500	200	100

TABLE 1 - 3

MEDICAL CARE RESOURCES IN CERTAIN DEVELOPING COUNTRIES IN 1966.

Source: United Nations (1969/70). World Economic Survey. Publication No.E.71.II.C.1.

Country	Population per Physician	Population per Nurse	Population per Hospital Bed
Bolivia	3100	3700	400
Haiti	14000	14400	1990
Chad	90000	2800	900
Congo (D.R.)	26000	13400	280
Guinea	46900	4100	530
Mali	51100	3800	1340
Nigeria	27000	5800	2190
Ethiopia	64600	24400	2470
Ruanda	76300	21200	750
Tanzania	17300	2600	560
Upper Volta	76200	4400	1680
Sudan	24600	3400	1010
India	4800	8700	1670
Pakistan	6000	16200	2820

0.4 - 3 per person in developing countries.)[1]

These meagre resources have to cope with a much larger problem in developing than in developed countries. The health condition, as reflected by three health indicators, i.e. crude death rate, infant mortality and life expectancy shown in Table 1 - 4, reflect the vast difference in health condition between developed and developing nations. While in developed countries the average crude death rate is about 9.4, the average is as high as 17 per 1,000 population in developing countries. While for developed countries infant mortality (a more accurate indicator of health) is only 29 per 1,000 live births on the average, it is as high as 118 per 1,000 live births for developing countries on the average. Also, while the average person in a developed country expects a life duration of 70 years, the average person in a developing country expects only 45 years duration of life.

This poor state of health in developing countries demonstrates the tremendous pressures exerted on so few medical care resources. If modern medical care is to become a viable proposition in developing countries, it has to stand up to the challenge by becoming more efficient and effective. Its distribution should be more rational. It has to adapt itself to an intermediate technology, both in deeds and in attitudes.[2]

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(1) Livingstone, A. (1969). Social Policy in Developing Countries. New York: Routledge and Kegan Paul.

(2) King, Maurice. (1966). Medical Care in Developing Countries: A Symposium from Makerere. Nairobi: Oxford University Press.

TABLE 1 - 4

MORTALITY EXPERIENCE AND LIFE EXPECTANCY BETWEEN DEVELOPED AND DEVELOPING COUNTRIES (1968).

(AVERAGES).

SOURCE: World Economic Survey 1969 - 1970. U.N.Sale No.E.71.II.C.1.

Health Indicator	Developing Countries				Developed Countries
	Western Hemisphere	Africa	Asia	Average	Average
1. Crude Death Rate (per 1,000 population)	11	21	17	17	9.4
2. Infant Mortality (per 1,000 live births)	81	123	122	118	29
3. Life Expectancy (years)	61	40	44	45	70

The highest level of care should not be monopolized by elites, but it should be selectively proportioned to meet the requirements of those who are in greatest need of it.

1.1.4 Budgetary Constraints

The quantity as well as the quality of medical care in a country as indicated in the previous discussion, is not determined by the state of health of the population but rather by the level of prosperity of that country. In countries where the bulk of medical care resources are in the hands of the public sector the quantity and the quality is largely determined by the total public expenditure and the share of the health care sector of that cake.

Although there is an international consensus of opinion as to the need for some scientific means by which priorities in public expenditures should be established, such means, unfortunately, do not exist at the present time. All that can be done to establish priorities among the different sectors is through a general notion of a "balanced" and "integrated" economic and social development as previously mentioned. Decisions on priorities emerge greatly influenced by political motivations, public pressure and professional bias and may bear very little relation to rationality.

Although the input - output budget methodology can be used to establish priorities within the so-called productive sectors, it is difficult to apply it to the so-called unproductive or social sectors in which output cannot be measured in comparable terms.[1] This inherent difficulty puts the economic sectors of development at a greater advantage in attaining a higher share in public expenditure at the expense of the social sectors. This is particularly the case among poorer nations where there are confirmed convictions that more can be achieved for their ultimate well-being through economic rather than through social development.

Even if public preferences and public pressures are allowed to play a part in shaping these priorities, people can identify themselves with campaigns for better education, better housing, better roads or even better prisons more readily than with those for better health.[2] This is particularly true for many developed countries and to a certain extent for many developing countries. So, the health sector may lose on this front as well. Consequently, the health sector is likely to secure less than its fair share of governments' budgets. This will obviously affect the quantity as well as the quality of medical care that will be forthcoming to meet the heavy burden placed on it by the general health level which needs urgent improvement.

Such budgetary constraints will automatically put a limit on the level of care that a community can get in rela-

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(1) Rudoe, W. "Allocation of Resources within the Health and Welfare Services". The Economics of Medical Care: Studies in Economics, No.7; ed. M.M. Hauser. York: University of York.

(2) Salter, H.C. "Public Health Expenditure and the Health and Welfare Services". The Economics of Medical Care: Studies in Economics, No.7; ed. M. M. Hauser. York: University of York.

tion to its health condition. Accordingly the community should be prepared to accept this level and restrain its demands to match it.

In developing countries where these budgetary constraints are greater, the quantity as well as the quality of care that can be afforded should be carefully distributed in order to match the quantity as well as the quality of need for it.

In most developing countries this limitation imposed by the inadequacy of resources, as well as the budgetary constraints, has been realized. Medical authorities are adapting their medical technology to cope with the distributional problems. While the standard institutions or hospitals of the type available in developed countries exist, though fewer in number, ranges of sub-standard institutions, i.e. one doctor-hospitals, dispensaries, dressing stations or first-aid posts, etc., are created in an effort to bring the benefits of modern medicine close to the people. Although these institutions were conceived as part of an integrated system of progressive care similar to that existing in many developed countries, an essential requirement for such a system to function properly is lacking. Its constituent parts are very dispersed and inaccessible. Without a workable system of "referrals" these substandard institutions will tend to work as independent entities, and as a result the facilities and accordingly the medical care will be far from being equitably distributed. The high level of care available in the standard hospitals which are adequatèly equipped to cater for high level diagnosis and treatment of illnesses remains a privilege of those who were lucky to be born in big urban centres where it is usually provided. For the rest of the population, the only level of care attainable is that possible in sub-standard institutions, which can only offer limited help and relief of suffering. This state of affairs will lead to sub-optimal distribution of resources, in view of the vast size of rural populations (ranging between 70 - 90% of the total population in most developing countries).

1.2.0 POLICY CONCEPTUALIZATION

1.2.1 Goals of Health Service Planning

In the fast changing health scene, planning as a scheme of action must apply. The emphasis in health planning is on the goal setting that determines the policy which leads to the fulfilment of the specific objectives related to the original goal. Programmes are devised in order to meet the set of objectives that can satisfy the major goals. In the planning methodology, the programmes are only evaluated in relation to their specific objectives, while the objectives themselves are evaluated in relation to the major goal. The effectiveness of programmes is judged by the degree to which they are successful in the fulfilment of their predetermined objectives, while the effectiveness of these objectives is judged by their success in approaching or coming nearer to the major goal.[1]

In health service planning, programmes change and so do the objectives determining them due to the changing nature of people's health problems through time. But the broadly defined goal hardly undergoes any major change. It is characterized by permanence whereas the subordinate objectives fluctuate depending on existing conditions of health of the community, the means that are available and the efficiency by which these means can be utilized.

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(1) Sigmond, Robert M. (1967), "Health Planning". Medical Care (May - June),5:3.

Within this conceptualization of the planning methodology economic and social theories can be discussed to assess how far they can influence a policy for the distribution of medical care.

The major goal in the provision of medical care is not the maximization of the provision of doctors, hospitals and health centres etc. as is often implied. These are only means towards an ultimate goal, which is the improvement of the health condition of the people. If such means were conceived as planning goals in themselves they would be the equivalent to a motor manufacturer trying to maximize, not his output of vehicles, but the number of his workers and the size of his factory.

In the capitalist world, economic theory has evolved in connection with the concept of market and business ideas. Its main goal is conceived as the maximization of economic return. As a purely business idea, it has no recognizable objective other than increasing profitability in the provision of goods and services.(1) So, in relation to economic theory the previously mentioned planning goal for the health service provision, is vague and unclearly defined. The task of maximizing health condition does not clearly guarantee the maximization of profit. In fact, health accounting does not lead to any profit at all.(2) Accordingly, economic theory seems to be

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(1) Rudoe, W., "Allocation of Resources within the Health and Welfare Services", Op.Cit.

(2) Rudoe, W., Op. Cit.

at variance with the objective of health care provision.

On the other hand, social theory has evolved without any specific or clearly defined goal. It is a normative theory. The theories of Spencer, Weber, Durkheim and Marx can be seen as an intellectual response to the impact of social change upon the traditional social order. Each of these theoreticians was concerned with those social problems created by social change and the contribution that the social scientist might make towards their resolution.(1) However, the theory of social policy and administration which is supposed to derive from these early social theories seem to have some form of limited objectives. Broadly speaking, it is a corrective theory. In its modern context it makes practical attempts to modify the relationship between economic and social "markets" that exist in an industrialized world. With the major goal of health service provision this theory seems to be in congruence even though it suffers from its link with the economic theory.

1.2.2 Economic Theory and Medical Care Priorities

Rational economic planning, whatever technique is used, requires a measure of output. This has to be specified in a precise quantitative form in order to establish its relationship to the input - a relationship between blocks of expenditure and measured steps towards specified objectives. There are,

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(1) Pinker, R. (1971). Social Theory and Social Policy. London: Heinemann Educational Books Ltd.

other two stages, a larger distance indicated lower demands for primary care institutions. These conflicting interaction effects were mainly due to differences in situational conditions. Greater demands resulted when a dispensary or a dressing station was available while lower demands resulted when no dispensary or dressing station was available. Other predictors, like the type of curative facilities available and the distance to the nearest Class B or C hospital were each employed twice in the analysis. Their effect on demand was consistent even though different values of the same predictors were employed in the differentiation in each case. Predictors representing the household age structure, the type of sub-region and the distance to the nearest dispensary or dressing station were only relevant when the household's primary need was 3,500 units/1,000 or more. The predictor describing the members in the age group 40 years and above was only relevant if a dispensary or a dressing station was available and the primary need was 7,500 units/1,000 or more. On the other hand, the predictor describing members in the age group 17 years and below was only relevant when the household resided in either South Blue Nile or White Nile sub-regions, provided that no dispensary or dressing station was available, and the need for primary care exceeded 3,499 units/1,000.

Table 9 - 7 gives a summary of the final prediction groups of demand for primary care institutions. The table shows the characteristics of each final group, its mean predicted demand for primary care institutions per 1,000 persons, in

TABLE 9 - 7

CHARACTERISTICS OF FINAL PREDICTION GROUPS IN A.I.D. ANALYSIS OF DEMAND FOR PRIMARY CARE INSTITUTIONS (VISITS/1000/YEAR).

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Primary Care Inst. (visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) (1) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
18	37	3.8	7 777.0	0.068	Primary care need $\geq$ 7500units/1000; Only Dispensary or Dressing station available; 40 years and above $<$ 12%.
21	41	4.0	6 477.7	0.060	Primary care need $\geq$ 3500 $<$ 7500 units/1000; Only Dispensary or Dressing station available; Hospital B or C $\geq$ 30kms; Hospital A $\geq$ 60kms.
15	57	5.6	5 551.3	0.103	Primary care need $\geq$ 7500units/1000; Hospital A, B, C or no facilities available; In North Blue Nile.

TABLE 9 - 7

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Primary Care Inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
19	33	3.5	5 481.9	0.042	Primary care need ≥7500units/1000; Only Dispensary or Dressing station available; 40 years and above ≥ 12%.
25	30	2.9	4 982.6	0.034	Primary care need ≥ 2500 < 3500 units/1000; Only dispensary or dressing station available; Hospital B or C ≥ 35kms.
20	34	3.3	4 673.6	0.028	Primary care need ≥ 3500 < 7500 units/1000; Only dispensary or dressing station available; Hospital B or C ≥ 30kms; Hospital A < 60kms.

TABLE 9 - 7

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Primary Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
12	90	9.0	3 690.1	0.075	Primary care need $\geq 3500 < 7500$ units/1000; Only Dispensary or Dressing station available; Hospital B or C $<$ 30kms.
31	44	4.7	3 295.0	0.030	Primary care need $\geq 3500 < 7500$ units/1000; Hospital A or no facilities available; In North Blue Nile; Hospital B or C $\geq$ 1km.
22	33	2.5	2 994.5	0.043	Primary care need $\geq$ 3500units/1000; Hospital B or C or no facilities available; In South Blue Nile or White Nile; No member 17 years and below.

TABLE 9 - 7

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Primary Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
29	54	4.4	2 778.1	0.018	Primary care need $\geq$1000 < 2500 units/1000; Only Dispensary or Dressing station available; Hospital A $\geq$ 200kms.
24	62	5.5	2 581.1	0.030	Primary care need $\geq$2500 < 3500 units/1000; Only Dispensary or Dressing station available; Hospital B or C < 35kms.
32	36	3.0	2 438.7	0.018	Primary care need $\geq$3500units/1000; Hospital B, C or no facilities available; In South Blue Nile or White Nile; At least one member 17 years and below; Hospital A < 150kms.

however, few fields where output is as hard to measure as it is in the health service.

It is possible to measure the quantity of services which are provided in units such as patients treated, persons immunized or area sprayed with D.D.T., but these activities which are recorded, are only means to an end which is the improvement of health. They are, moreover, only part of the methods by which health is improved.

The health of the population depends on many factors, such as nutrition and environment which are not normally under the control of the health sector. Nevertheless, if the output of the health services is to be measured, the contribution they make to the health status needs to be isolated.

One of the decisions that have to be taken at the start is to select the unit of measurement. Better health can bring economic rewards by the postponement of death, by increasing work attendance and working capacity. It can increase the yield of human capital by keeping it in good repair and prolonging its working life. It can increase yield from investment in education, raises or lowers birth rates, and increases the size of the population particularly the aged population.(1)

In the fight for appropriations, the health administrator may find it prudent to stress the gains to the economy from better health and seek help from economists in quantifying economic losses caused by particular diseases, not only by mor-

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(1) Abel-Smith, B. (1972), "Health Priorities in Developing Countries: The Economist Contribution". International Journal of Health Services, 2:1.

TABLE 9 - 7

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Primary Care Inst.(Visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
38	46	2.0	1 642.5	0.006	Primary care need $\geq$ 3500units/1000; Hospital B, C or no facilities available; In South Blue Nile or White Nile; At least one member 17 years and below; Hospital A $\geq$ 150kms; Dispensary or Dressing station $<$ 4kms.
28	96	9.1	1 589.1	0.031	Primary care need $\geq$ 1000 $<$ 2500 Units/1000; Only Dispensary or Dressing station available; Hospital A $<$ 200kms.

TABLE 9 - 7

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Primary Care Inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
36	279	11.9	908.4	0.015	Primary care need $<$ 3500units/1000; Hospital A or no facilities available; Hospital A $<$ 200kms;
26	65	5.3	484.0	0.003	Primary care need $<$ 1000units/1000; Only Dispensary or Dressing station available.
30	98	2.2	450.8	0.004	Primary care need $\geq$ 3500 $<$ 7500 units/1000; Hospital B or C available; In North Blue Nile.

TABLE 9 - 7

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Primary Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
39	54	5.5	417.8	0.003	Primary care need $\geq$ 3500units/ 1000; Hospital B, C or no facilities available; In South Blue Nile or White Nile; At least one member 17 years and below; Hospital A $\geq$ 150kms; Dispensary or Dressing station $\geq$ 4kms.
37	49	5.3	176.1	0.001	Primary care need $<$ 3500units/ 1000; No facilities available; Hospital A $\geq$ 200kms.

TABLE 9 - 7

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Primary Care Inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
34	228	6.7	17.0	0.000	Primary care need <3500units/1000; Hospital B or C available.

Mean of Demand for Primary Care Institutions in region = 2604.8 visits/1000/year.

x Total does not add up to 100% due to rounding up error.

(1) Unexplained variance in Group refers to the variance within the Group still not accounted for as a proportion of the total unexplained variance in the sample $(TSS)_i/(TSS)_T$ gives the proportion for Group (i).

addition to the number of households in the sample with such characteristics, the percentage of households in the region belonging to each group and the proportion of unexplained variance still remaining in each group. The table indicates that about 43.5% of the households in the region had demands for primary care institutions above the regional average while 56.5% of the households had demands below the regional average. It also indicates that while 3.8% of the households in the region had extremely high demands for primary care of over 7,750 visits/1,000 (Group 18), 6.7% of the households had extremely low demands of less than 20 visits/1,000 (Group 34).

The level of precision in prediction was indicated by the proportion of unexplained variance remaining in each final group. With the exception of Group 15 which had a comparatively high proportion of unexplained variance still remaining (0.103), all the groups had very small proportions of unexplained variance not exceeding 0.075.

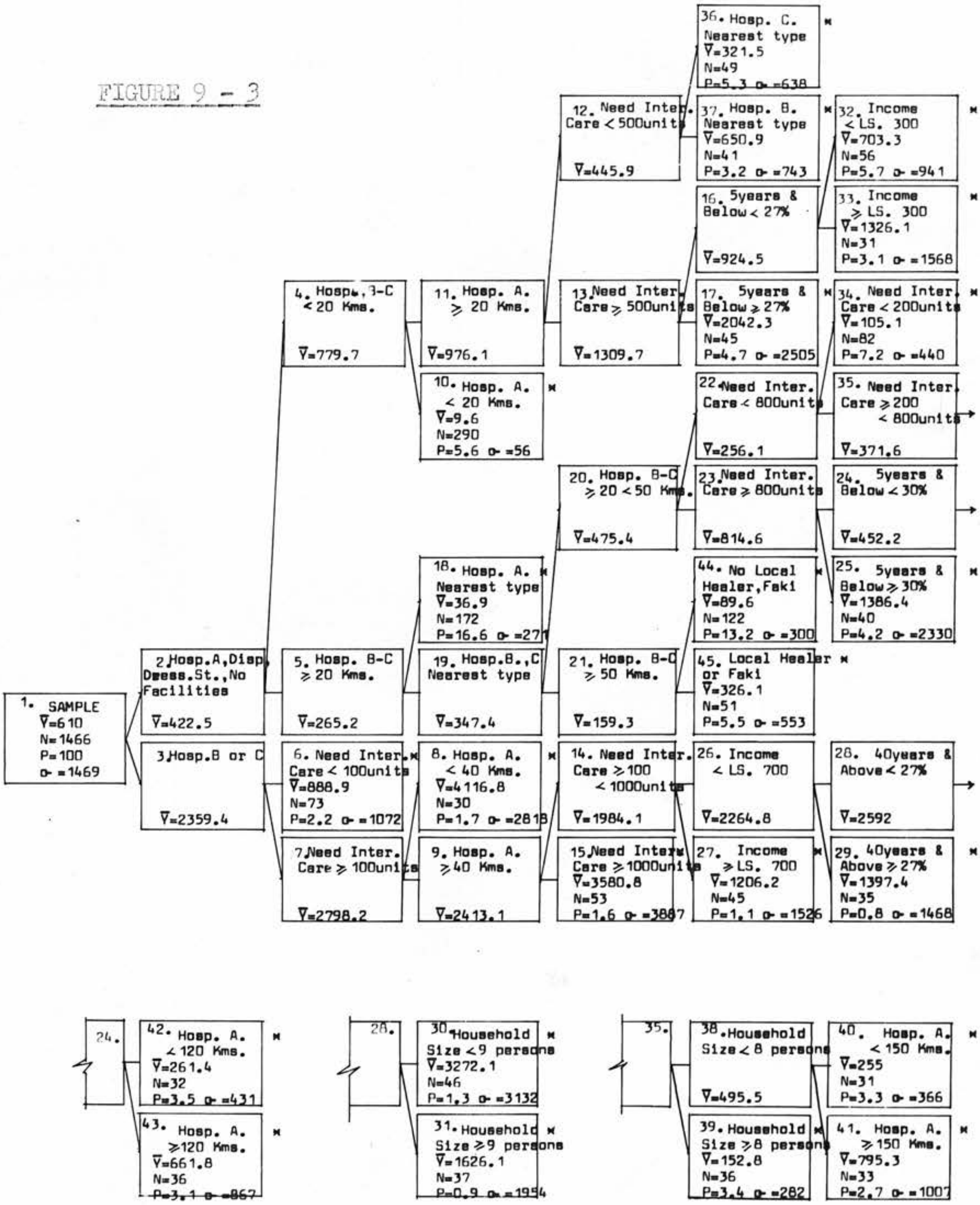
II. Demand for Intermediate Care Institutions

The predictor tree showing how the predisposing need component together with the enabling components explained demand for intermediate care institutions appears in Figure 9 - 3. Twenty-two splits were performed by the A.I.D. programme using ten of the possible predictors. Only need for intermediate care was introduced to represent the predisposing component. The analysis started with Group 1 representing the whole sample with mean demands of 610 visits/1,000 to intermediate care institutions.

FIGURE 9 - 3

PREDICTOR TREE FOR THE A.I.D. ANALYSIS OF DEMAND FOR INTERMEDIATE CARE INSTITUTIONS

FIGURE 9 - 3



(V̄) =GROUP MEAN IN UNITS/ 1000 PERSONS

(N) =NUMBER OF HOUSEHOLDS IN SAMPLE.

(P) =PERCENTAGE OF HOUSEHOLDS IN REGION.

(σ) =STANDARD DEVIATION.

(*) =FINAL GROUP.

The first split indicated the importance of the type of general curative facilities available. Households where no Class B or C hospital was available (Group 2) had less demands for intermediate care institutions, with means of 422.5 visits/ 1,000, than those where a Class B or C hospital was available (Group 3) with mean demands amounting to 2,359.4 visits/1,000.

The second split indicated the importance of the distance to the nearest Class B or C hospital on households without such a hospital (Group 2). Households located at less than 20 kilometres from the nearest Class B or C hospital (Group 4) had more demands for intermediate care institutions, with means of 779.7 visits/1,000, than those located at 20 kilometres or more from such a hospital (Group 5) with mean demands amounting to 265.2 visits/1,000.

The third split indicated the importance of need for intermediate care on households where a Class B or C hospital was available (Group 3). Households with needs for intermediate care of less than 100 units/1,000 (Group 6) had less demands for intermediate care institutions, with means of 888.9 visits/ 1,000, than those with needs of 100 units/1,000 or more (Group 7) with mean demands amounting to 2,798.2 visits/1,000.

The fourth split indicated the importance of the distance to the nearest Class A hospital on households with needs for intermediate care of 100 units/1,000 or more (Group 7). Households located at less than 40 kilometres from the nearest Class A hospital (Group 8) had more demands for intermediate care institutions, with means of 4,116.8 visits/1,000, than those located at 40 kilometres or more from such a hospital (Group 9) with mean demands amounting to 2,413.1 visits/1,000.

The distance to the nearest Class A hospital also accounted for the fifth split on households where the nearest Class B or C hospital was less than 20 kilometres away (Group 4). Households located at less than 20 kilometres from the nearest Class A hospital (Group 10) had less demands for intermediate care institutions, with means of 9.6 visits/1,000, than those located at 20 kilometres or more from such a hospital (Group 11) with mean demands amounting to 976.1 visits/1,000.

Need for intermediate care also accounted for the sixth split on households located at 20 kilometres or more from the nearest Class A hospital (Group 11). Households with needs for intermediate care of less than 500 units/1,000 (Group 12) had less demands for intermediate care institutions, with means of 445.9 visits/1,000, than those with needs of 500 units/1,000 or more (Group 13) with mean demands amounting to 1,309.7 visits/1,000.

Need for intermediate care also accounted for the seventh split on households located at 40 kilometres or more from the nearest Class A hospital (Group 9). Households with needs for intermediate care of between 100 and 999 units/1,000 inclusive (Group 14) had less demands for intermediate care institutions, with means of 1,984.1 visits/1,000, than those with needs of 1,000 units/1,000 or more (Group 15) with mean demands amounting to 3,580.8 visits/1,000.

The eighth split indicated the importance of the age group 5 years and below on households with needs for intermediate care of 500 units/1,000 or more (Group 13). Households where members in the age group 5 years and below constituted less than 27% of the household members (Group 16) had less demands for intermediate care institutions, with means of 924.5 visits/1,000, than those where such members constituted 27% or more of the household members (Group 17) with mean demands amounting to 2,042.3 visits/1,000. This implied that young members of 5 years and below are the cause of such high demands.

The ninth split indicated the importance of the type of nearest hospital on households where the nearest Class B or C hospital was located at 20 kilometres or more (Group 5). Households where a Class A hospital was the nearest (Group 18) had less demands for intermediate care institutions, with means of 36.9 visits/1,000, than those where a Class B or C hospital was the nearest (Group 19) with mean demands amounting to 347.4 visits/1,000.

The distance to the nearest Class B or C hospital accounted for the tenth split on households where a Class B or C hospital was the nearest hospital (Group 19). Households located at between 20 and 49 kilometres from the nearest Class B or C hospital (Group 20) had more demands for intermediate care institutions, with means of 475.4 visits/1,000, than those located at 50 kilometres or more from the nearest Class B or C hospital (Group 21) with mean demands amounting to 159.3 visits/

tality, but by the known risk of disease, for example, particular fertile stretches of a country may be depopulated and uncultivated because of health risks. The dangers of economic developments without health safeguards will also be stressed, for example, irrigation schemes which can easily become the breeding grounds for hazards to health. But while it may on occasion be practical to deploy economic arguments no one would wish to see priorities in health established by economic criteria alone.

Crude cost benefit analysis in which the only benefits measured are economic benefits, can have limited application in health. While some health programmes can be shown to have a large economic pay-off, there are others in which the economic benefits are not merely less than the cost, but negative. Programmes which substitute permanent disability for death are the reverse of economic, so are programmes which increase life without increasing working life proportionately, except, perhaps, indirectly if the elderly care for the children and this enables their parents to increase their work attendance. So also are programmes which lead to increased population which is more rapid than increase in opportunities. Nevertheless, there are programmes which could produce a high economic return especially in developing countries and these have to be discovered. What would be wrong would be to base priorities on economic considerations only.[1] If health programmes were to be geared

(1) Abel-Smith, B., Op. Cit.

1,000.

Need for intermediate care also accounted for the eleventh split on households located at between 20 and 49 kilometres from the nearest Class B or C hospital (Group 20). Households whose needs for intermediate care were less than 800 units/1,000 (Group 22) had less demands for intermediate care institutions, with means of 256.1 visits/1,000, than those whose needs were 800 units/1,000 or more (Group 23) with mean demands amounting to 814.6 visits/1,000.

The age group 5 years and below also accounted for the twelfth split on households whose needs for intermediate care were 800 units/1,000 or more (Group 23). Households in which members in the age group 5 years and below constituted less than 30% of the household members (Group 24) had less demands for intermediate care institutions, with means of 452.2 visits/1,000, than those where such members constituted 30% or more of the household members (Group 25) with mean demands amounting to 1,386.4 visits/1,000. This again implied that the presence of young members of 5 years and below enabled the household to use excessive intermediate care institutions irrespective of need.

The thirteenth split indicated the importance of household income on households whose needs for intermediate care were between 100 and 999 units/1,000 (Group 14). Households with incomes of less than LS 700 a year (Group 26) had more demands for intermediate care institutions, with means of 2,264.8 visits/1,000, than those with incomes of LS 700 or more (Group 27) with mean demands amounting to 1,206.2 visits/ 1,000. The reason for the low demands by high income households could be due to either their ability to pay for transport costs to secure a higher level of curative care in a Class A hospital or their ability to buy a higher quality of privately provided curative care as a substitute for the curative care available in a Class B or C hospital.

The fourteenth split indicated the importance of the age group 40 years and above on low income households with yearly incomes of less than LS 700 (Group 26). Households in which members in the age group 40 years and above constituted less than 27% of the household members (Group 28) had more demands for intermediate care institutions, with means of 2,592 visits/1,000, than those in which such members constituted 27% or more (Group 29) with mean demands amounting to 1,397.4 visits/1,000. This implied that the presence of old people of 40 years and above constrained the household's ability to make excessive demands on curative care institutions. This could be due either to old people's lack of faith in modern medicine or to their failure in realizing the severity of ill-health which required urgent medical care.

The fifteenth split indicated the importance of the household size on households where members in age group 40 years and above constituted less than 27% of the household members (Group 28). Households of sizes less than 9 persons (Group 30) had more demands for intermediate care institutions, with means of 3,272.1 visits/1,000, than those of sizes of 9 persons or more (Group 31) with mean demands amounting to 1,626.1 visits/1,000.

Household income also accounted for the sixteenth split on households where members in the age group 5 years and below constituted less than 27% of the household members (Group 16). Households with yearly income of less than LS 300 (Group 32) had less demands for intermediate care institutions, with means of 703.3 visits/1,000, than those with yearly incomes of LS 300 or more (Group 33) with mean demands amounting to 1,326.1 visits/1,000. The excessive demands attributed to high income households in this case could be due to high social status. High income households attach more value to their health condition and are therefore tempted to make excessive demands for these types of institutions.

Need for intermediate care also accounted for the seventeenth split on households with needs of less than 800 units/1,000 (Group 22). Households with needs for intermediate care of less than 200 units/1,000 (Group 34) had less demands for intermediate care institutions, with means of 105.1 visits/1,000, than those with needs between 200 and 799 units/1,000 (Group 35) with mean demands amounting to 371.6 visits/1,000.

The type of nearest hospital accounted for the eighteenth split on households with needs for intermediate care of less than 500 units/1,000 (Group 12). Households where a Class C hospital was the nearest type (Group 36) had less demands for intermediate care institutions, with means of 321.5 visits/1,000, than those where a Class B hospital was the nearest type (Group 37) with mean demands amounting to 650.9 visits/1,000.

This could be due to people's beliefs about the quality of care which could be secured from either type. Because it was generally believed that a Class B hospital was capable of providing a higher quality of care than a Class C hospital more demands are made when a Class B was the nearest hospital.

Household size also accounted for the nineteenth split on households with needs for intermediate care of between 200 and 799 units/1,000 (Group 35). Households of sizes less than 8 persons (Group 38) had more demands for intermediate care institutions, with means of 495.5 visits/1,000, than those of sizes of 8 persons or more (Group 39) with mean demands amounting to 152.8 visits/1,000.

The distance to the nearest Class A hospital also accounted for the twentieth split on households of sizes of less than 8 persons (Group 38). Households located at less than 150 kilometres from the nearest Class A hospital (Group 40) had less demands for intermediate care institutions, with means of 255 visits/1,000, than those located at 150 kilometres or more from the nearest Class A hospital (Group 41) with mean demands amounting to 795.3 visits/1,000.

The distance to the nearest Class A hospital also accounted for the twenty-first split on households where the members in age group 5 years and below constituted less than 30% of the household members (Group 24). Households located at less than 120 kilometres from the nearest Class A hospital (Group 42) had less demands for intermediate care institutions, with means of 261.4 visits/1,000, than those located at 120 kilometres or more from the nearest Class A hospital (Group 43) with mean demands amounting to 661.8 visits/1,000.

The twenty-second and last split indicated the importance of the availability of a local healer ("Faki") on households where the nearest Class B or C hospital was located at 50 kilometres or more (Group 21). Households where no local healer ("Faki") was available (Group 44) had less demands for intermediate care institutions, with means of 89.6 visits/1,000, than those where a local healer was available (Group 45) with mean demands amounting to 326.1 visits/1,000. This implied that the presence of native medicine in a community encouraged people to seek modern medical care facilities. This could be a result of modern attitudes against native or religious practices which provided the incentive for using the formal curative care facilities.

In the foregoing analytical process, it was the type of general curative facilities available to the households which provided the initial split. The need predictor, however, was employed later in the analysis, but was able to appear five times during the analysis to differentiate between high demand and low demand households. Although a different range of need was used at each stage, the need was consistent in its effects on demands, i.e. higher needs always produced higher demands. The predictor describing the distance to the nearest Class A hospital was employed four times during the analysis to differentiate between high and low demanders. But its effects on demand were not consistent. In three cases the nearness of a Class A hospital produced a constraint on the demand for intermediate care institutions, while in the fourth case it produced an encouraging effect for more demand for intermediate care institutions. This was due to the existence of different situational conditions. In the cases where it produced a constraining effect on demand, neither a Class B or C hospital was available in the settlement of residence. On the other hand, in the case where it produced an encouraging effect on demand, either a Class B or C hospital was available. Other predictors like household size, members in age group 5 years and below, distance to the nearest Class B or C hospital, the type of nearest hospital and household income, were each employed twice in the analysis. Each of the first three predictors had consistent effects on demand on the two occasions on which they were used. But each of the last two predictors, i.e. the type of nearest hospital and household income, had differing effects on demand on the two occasions they were used. With regard to type of nearest hospital, the first occasion showed that the higher the level of the nearest hospital was, the lower the demand for intermediate care institutions would be. The other occasion, however, showed that the higher the level of the nearest hospital was, the greater the demand for intermediate care would be. As far as household income, similar contradicting effects were shown. On the first occasion, lower incomes produced higher demands while on the second occasion lower incomes produced lower demands. These conflicting interaction effects were mainly the results of different situational conditions. It should be pointed out that such predictors as members in the age group 5 years and below, the availability of a local healer or the type of nearest hospital were relevant only if no Class B or C hospital was available in the settlement of residence. On the other hand, a predictor like members in the age group 40 years and above was relevant only if a Class B or C hospital was available in the settlement of residence.

Table 9 - 8 gives a summary of the final prediction groups which emerged from the A.I.D. analysis. The table gives the characteristics of each final group and its mean value of demand for intermediate care institutions in addition to the number of households in the sample with such characteristics, the percentage of households in the region belonging to the group and the proportion of unexplained variance still remaining in each group. The table indicated that about 36.5% of the households in the region had demands for intermediate care institutions more than the average, while 63.6% of the households had demands less than the average. Among the high demanders, 4.6% of the households had extremely high demands of more than 3,250 visits/1,000 (i.e. Groups 8, 15 and 30). Among the low demanders, 22.2% of the households had extremely low demands of less than 40 visits/1,000 (i.e. Groups 18 and 10).

III. Demand for Secondary Care Institutions

The predictor tree showing how the components explained demand for secondary care institutions appears in Figure 9 - 4. Fourteen splits were performed by the A.I.D. programme using nine of the possible predictors. Only need for secondary care was introduced to represent the predisposing component.

TABLE 9 - 8

CHARACTERISTICS OF FINAL PREDICTION GROUPS IN A.I.D. ANALYSIS OF DEMAND FOR INTERMEDIATE CARE INSTITUTIONS (VISITS/1000/YEAR).

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst. (visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
8	30	1.7	4 116.8	0.062	Hospital B or C available; Intermediate care need $\geq$ 100 units/1000; Hospital A $<$ 40kms.
15	53	1.6	3 580.8	0.109	Hospital B or C available; Intermediate care need $\geq$ 1000 units/1000; Hospital A $\geq$ 40kms.
30	46	1.3	3 272.1	0.060	Hospital B or C available; Intermediate care need $\geq$ 100 $<$ 1000units/1000; Hospital A $\geq$ 40kms; Income $<$ LS 700; 40 years and above $<$ 27%; Household size $<$ 9 persons.

TABLE 9 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
17	45	4.7	2 042.3	0.135	Dispensary, Dressing station or no facilities available; Hospital B or C $<$ 20kms; Hospital A $\geq$ 20kms; Intermediate care need $\geq$ 500 units/1000; 5 years and below $\geq$ 27%.
31	37	0.9	1 626.1	0.017	Hospital B or C available; Intermediate care need $\geq$ 100 $<$ 1000units/1000; Hospital A $\geq$ 40kms; Income $<$ LS 700; 40 years and above $<$ 27%; Household size $\geq$ 9 persons.

TABLE 9 - 8

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
29	35	0.8	1 397.4	0.009	Hospital B or C available; Intermediate care need $\geq$ 100 $<$ 1000units/1000; Hospital A $\geq$ 40kms; Income $<$ LS 700; 40 years and above $\geq$ 27%.
25	40	4.2	1 386.4	0.105	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq$ 20 $<$ 50kms; Hospital B or C nearest hospital; Intermediate care need $\geq$ 800 units/1000; 5 years and below $\geq$ 30%.

solely to serve crude economic objectives they would need to concentrate heavily on the younger worker. Infant and maternal mortality would be fought only to the extent necessary to ensure that the next generation of human capital would be of the right number to fit expected job opportunities, and the health planner would do nothing to prevent disease and death among the permanently disabled or the unproductive population.

For all these reasons it would seem inappropriate to pursue economic analysis as a basis for establishing priorities in the allocation or the distribution of health service resources. However, economic theory can best be used in producing a more efficient medical care system. Levitt[1] has outlined the steps for an economically efficient medical care system. Firstly, economy in the provision of medical care can be secured if each output in the medical "industry" can be produced at the lowest possible cost without sacrificing quality. Economy in this sense is determined by the relative costing of alternative programmes or actions and their marginal return rather than absolute profits. This involves the choice of the particular combination of input, e.g. doctors, nurses, drugs, etc., which costs least per unit of output, e.g. patients treated, provided that the quality of treatment is not reduced.

Secondly, economy can be secured if the share of each particular activity within the medical service, e.g. maternal care, dental care, etc., in the total resource available to

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(1) Levitt, M.S., "Problems of Efficiency" <u>The Economics of Medical Care</u>, ed. by M.M. Hauser, Op. Cit.

TABLE 9 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
33	31	3.1	1 326.1	0.036	Dispensary, Dressing station or no facilities available; Hospital B or C $<$ 20kms; Hospital A $\geq$ 20kms; Intermediate care need $\geq$ 500 units/1000; 5 years and below $<$ 27%; Income $\geq$ LS 300.
27	45	1.1	1 206.2	0.012	Hospital B or C available; Intermediate care need $\geq$100 $<$ 1000units/1000; Hospital A $\geq$ 40kms; Income $\geq$ LS 700.
6	73	2.2	888.9	0.012	Hospital B or C available; Intermediate care need $<$ 100 units/1000.

TABLE 9 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
41	33	2.7	795.3	0.013	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq 20 < 50$kms; Hospital B or C nearest hospital; Intermediate care need $\geq 200 < 800$units/1000; Household size < 8 persons; Hospital A ≥ 150kms.
32	56	5.7	703.3	0.023	Dispensary, Dressing station or no facilities available; Hospital B or C < 20kms; Hospital A ≥ 20kms; Intermediate care need ≥ 500 units/1000; 5 years and below $< 27\%$; Income $<$ LS 300.

Table 9 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
43	36	3.1	661.8	0.011	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq 20 < 50$kms; Hospital B or C nearest hospital; Intermediate care need ≥ 800 units/1000; 5 years and below $< 30\%$; Hospital A ≥ 120kms.
37	41	3.2	650.9	0.008	Dispensary, Dressing station or no facilities available; Hospital B or C $<$ 20kms; Hospital A $\geq$ 20kms; Intermediate care need < 500 units/1000; Hospital B nearest hospital.

TABLE 9 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
45	51	5.5	326.1	0.008	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq$ 50kms; Hospital B or C nearest hospital; Local healer or "Faki" available.
36	49	5.3	321.5	0.010	Dispensary, Dressing station or no facilities available; Hospital B or C $<$ 20kms; Hospital A $\geq$ 20kms; Intermediate care need $<$ 500 units/1000; Hospital C nearest hospital.

TABLE 9 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
42	32	3.5	261.4	0.003	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq 20 < 50$kms; Hospital B or C nearest hospital; Intermediate care need ≥ 800 units/1000; 5 years and below $< 30\%$; Hospital A < 120kms.
40	31	3.3	255.0	0.002	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq 20 < 50$kms; Hospital B or C nearest hospital; Intermediate care need ≥ 200 < 800 units/1000; Household size < 8 persons; Hospital A < 150kms.

TABLE 9 - 8

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
39	36	3.4	152.8	0.001	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq 20 < 50$kms; Hospital B or C nearest hospital; Intermediate care need ≥ 200 < 800units/1000; Household size ≥ 8 persons.
34	82	7.2	105.1	0.007	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq 20 < 50$kms; Hospital B or C nearest hospital; Intermediate care need < 200 units/1000.

TABLE 9 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
44	122	13.2	89.6	0.006	Dispensary, Dressing station or no facilities available; Hospital B or C $\geq$ 50kms; Hospital B or C nearest hospital; No local healer or "Faki".
18	172	16.6	36.9	0.006	Hospital A, Dispensary, Dressing station or no facilities available; Hospital B or C $\geq$ 20kms; Hospital A nearest hospital.

TABLE 9 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Intermediate Care Inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
10	290	5.6	9.6	0.000	Hospital A, Dispensary, Dressing station or no facilities available; Hospital B or C $<$ 20kms; Hospital A $<$ 20kms.

Mean of Demand for Intermediate Care Institutions in region = 610 visits/1000/year.

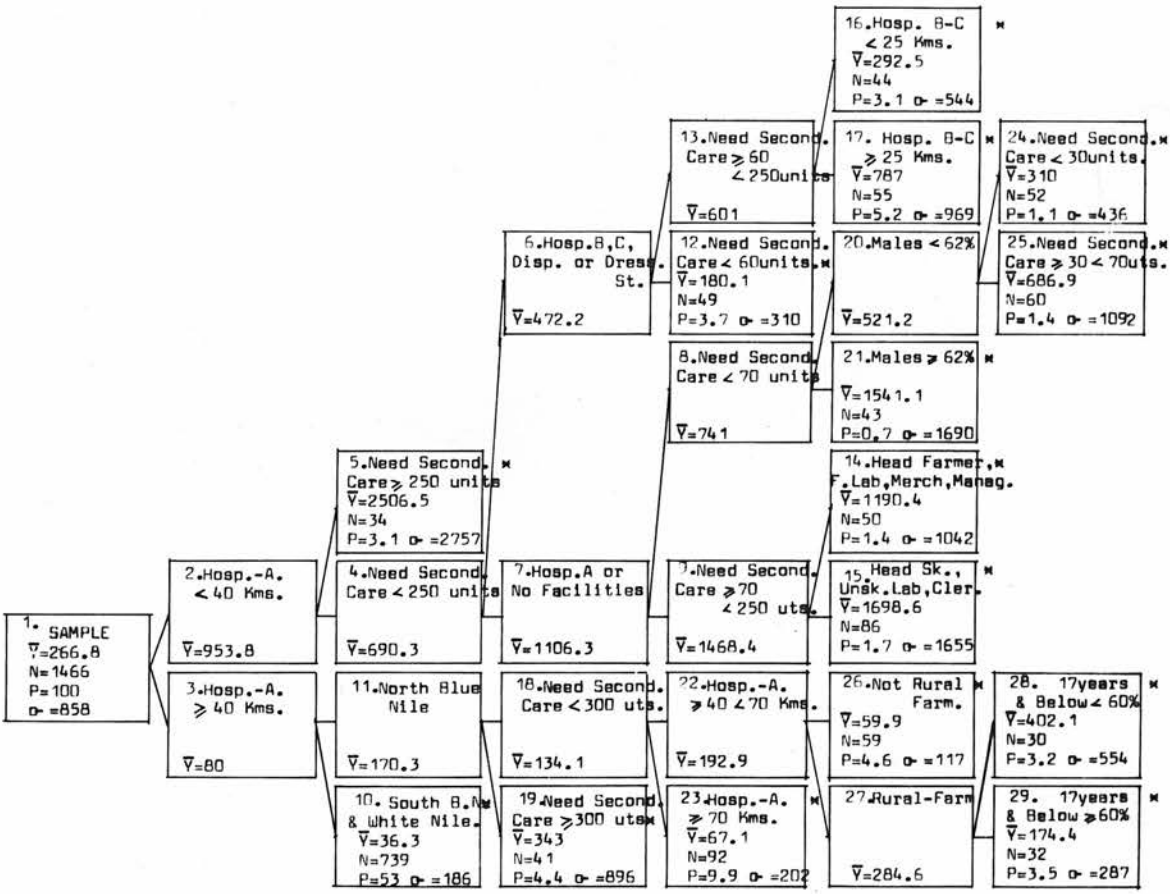
x Total does not add up to 100% due to rounding up error.

(1) Unexplained variance in Group refers to the variance within the Group still not accounted for as a proportion of the total unexplained variance in the sample $(TSS)_i/(TSS)_T$ gives the proportion for Group (i).

FIGURE 9 - 4

PREDICTOR TREE FOR THE A.I.D. ANALYSIS OF DEMAND FOR SECONDARY CARE INSTITUTIONS

FIGURE 9 - 4



(Y) = GROUP MEAN IN UNITS/1000 PERSONS.
(N) = NUMBER OF HOUSEHOLDS IN SAMPLE.
(P) = PERCENTAGE OF HOUSEHOLDS IN REGION.
(σ) = STANDARD DEVIATION.
(*) = FINAL GROUP.

medical care, is consistent with the community's relative priorities.

Thirdly, economy can be secured if the share of medical care in the total national resources is consistent with the community's relative preferences for medical care and alternative resource uses.

Fourthly, economy can be secured if the availability of medical care is determined in accordance with the community's distributional objectives. As the question of availability is a crucial factor in the distributional objective, its relation to policy and to the ultimate planning goal of the health services should be stressed.

The traditional notion of economic efficiency of allocation of resources involves the consideration of costs and of objectives which people reveal when the market mechanism is permitted to operate. But it is argued that in the case of medical care the conditions needed for optimal allocation via price mechanism are not present. Competition as a pre-requisite of the market mechanism does not exist. Equal knowledge on the part of medical care consumer and producer does not exist. There are also effects external to the individual medical care consumer. When a person gets ill, he is not only endangering himself, but may also be putting the whole community at risk. This is particularly true in the case of communicable diseases.(1)

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(1) Baumol, William J. (1952). Welfare Economics and the Theory of the State. Cambridge, Mass.: Harvard University Press.

The process started with Group 1 representing the whole sample with mean demands of 266.8 visits/1,000 to secondary care institutions.

The first split indicated the importance of distance to the nearest Class A hospital on demand for secondary care institutions. Households located at less than 40 kilometres from the nearest Class A hospital (Group 2) had more demands for secondary care institutions, with means of 953.8 visits/1,000, than those located at 40 kilometres or more from such a hospital (Group 3) with mean demands amounting to 80 visits/1,000.

The second split indicated the importance of need for secondary care on households located at less than 40 kilometres from the nearest Class A hospital (Group 2). Households with needs for secondary care of less than 250 units/1,000 (Group 4) had less demands for secondary care institutions, with means of 690.3 visits/1,000, than those with needs of 250 units/1,000 or more (Group 5) with mean demands of 2,506.5 visits/1,000.

The third split indicated the importance of the type of general curative facilities available in the settlement of residence on households whose needs for secondary care were less than 250 units/1,000 (Group 4). Households residing in settlements where either a Class B or C hospital or a dispensary or a dressing station was available (Group 6) had less demands for secondary care institutions, with means of 472.2 visits/1,000, than those residing in settlements where either a Class A hospital or no facilities were available (Group 7) with mean demands amounting to 1,106.3 visits/1,000.

Need for secondary care also accounted for the fourth split on households residing in settlements with either a Class A hospital or no facilities (Group 7). Households with needs for secondary care of less than 70 units/1,000 (Group 8) had less demands for secondary care institutions, with means of 741 visits/1,000, than those with needs ranging between 70 and 249 units/1,000 (Group 9) with mean demands amounting to 1,468.4 visits/1,000.

The fifth split indicated the importance of the type of sub-region on households located at 40 kilometres or more from the nearest Class A hospital (Group 3). Households in South Blue Nile or White Nile sub-regions (Group 10) had less demands for secondary care institutions, with means of 36.3 visits/1,000, than those in North Blue Nile sub-region (Group 11) with mean demands amounting to 170.3 visits/1,000.

Need for secondary care also accounted for the sixth split on households residing in settlements with either a Class B or C hospital or a dispensary or a dressing station (Group 6). Households with needs for secondary care of less than 60 units/ 1,000 (Group 12) had less demands for secondary care institutions, with means of 190.1 visits/1,000, than those with needs ranging between 60 and 249 units/1,000 (Group 13) with mean demands amounting to 601 visits/1,000.

The seventh split indicated the importance of the type of occupation of the household's main earner on households whose needs for secondary care were between 70 and 249 units/

1,000 (Group 9). Households whose main earners were either farmers, farm labourers, merchants, professional or managerial employees (Group 14) had less demands for secondary care institutions, with means of 1,190.4 visits/1,000, than those whose main earners were either skilled, unskilled labourers or clerical employees (Group 15) with mean demands amounting to 1,698.6 visits/1,000. The reason for lower demands by farming households could be due to unfavourable attitudes towards modern medicine. On the other hand, lower demands by households whose main earners were either merchants, professional or managerial employees could be due to their ability to purchase more privately provided higher qualities of curative care as a substitute for secondary care provided by the public institutions available in the region.

The eighth split indicated the importance of the distance to the nearest Class B or C hospital on households with needs for secondary care ranging between 60 and 249 units/ 1,000 (Group 13). Households located at less than 25 kilometres from the nearest Class B or C hospital (Group 16) had less demands for secondary care institutions, with means of 292.5 visits/1,000, than those located at 25 kilometres or more from such a hospital (Group 17) with mean demands amounting to 787 visits/1,000.

Need for secondary care also accounted for the ninth split on households in North Blue Nile (Group 11). Households with needs for secondary care of less than 300 units/1,000 (Group 18) had less demands for secondary care institutions, with means of 134.1 visits/1,000, than those with needs of 300 units/1,000 or more (Group 19) with mean demands amounting to 343 visits/1,000.

The tenth split indicated the importance of sex composition on households with needs for secondary care of less than 70 units/1,000 (Group 8). Households in which male members constituted less than 62% of the household (Group 20) had less demands for secondary care institutions, with means of 521.2 visits/1,000, than those in which male members constituted 62% or more of the household (Group 21) with mean demands amounting to 1,541.1 visits/1.000. This implied that females made lower demands for existing secondary care institutions than males in this particular case.

The distance to the nearest Class A hospital also accounted for the eleventh split on households with needs for secondary care of less than 300 units/1,000 (Group 18). Households located at a distance of between 40 and 69 kilometres from the nearest Class A hospital (Group 22) had more demands for secondary care institutions, with means of 192.9 visits/1,000, than those located at 70 kilometres or more from the nearest Class A hospital (Group 23) with mean demands amounting to 67.1 visits/1,000.

Need for secondary care also accounted for the twelfth split on households where male members constituted less than 62% of the household members (Group 20). Households with needs for secondary care of less than 30 units/1,000 (Group 24) had less demands for secondary care institutions, with means of

310 visits/1,000, than those with needs ranging between 30 and 69 units/1,000 (Group 25) with mean demands amounting to 686.9 visits/1,000.

The thirteenth split indicated the importance of the type of residence on households where the nearest Class A hospital was located at a distance ranging between 40 and 69 kilometres (Group 22). Households residing in settlements other than rural farm (Group 26) had less demands for secondary care institutions, with means of 59.9 visits/1,000, than those residing in rural farm settlements (Group 27) with mean demands amounting to 284.6 visits/1,000.

The fourteenth and last split indicated the importance of the age group 17 years and below on households in rural farm settlements (Group 27). Households in which members in the age group 17 years and below constituted less than 60% of the household members (Group 28) had more demands for secondary care institutions, with means of 402.1 visits/1,000, than those in which such members constituted 60% or more of the household members (Group 29) with mean demands amounting to 174.4 visits/1,000. This implied that in this particular case young people of 17 years and below made lower demands for this type of institutions than older people above that age. Excessive demands by people above 17 years of age could either be due to their anxiety for quick recovery from illnesses or to their financial ability to pay transport costs to secure high quality care.

In the foregoing analytical process, it was evident that the location of the secondary care institutions played the greatest role in determining the extent of demand for them. The predictor describing the distance to the nearest Class A hospital provided the initial split. The same predictor was also used another time. The effect of distance was consistent in both cases, the higher the distance the lower the demand. The importance of need in determining the level of demand was also stressed. The predictor describing need for secondary care was used five times during the analysis to differentiate high from low demanders. The effect of need on demand was consistent all through the analysis indicating that the higher the need was, the higher the level of demand would be. But the ranges of need within which the differentiation occurred were different in each case. The rest of the selected predictors were each used once. It should be pointed out that predictors like the type of general curative facilities available, the distance to the nearest Class B or C hospital, the percentage of males and the type of occupation the main earner had, were used only when the distance to the nearest Class A hospital was less than 40 kilometres and need for secondary care did not exceed 249 units/1,000. On the other hand, predictors like the type of urban-rural residence and percentage of members in the age group 17 years and below were employed only in the North Blue Nile sub-region when the distance to the nearest Class A hospital was 40 kilometres or more and need for secondary care did not exceed 299 units/1,000.

Table 9 - 9 gives a summary of the final prediction groups which emerged from the A.I.D. analysis. The table gives

the characteristics of each final group in the analysis of demand for secondary care institutions. The mean value for each group as well as the number of households in the sample with such characteristics, the percentage of households in the region belonging to each group and the proportion of unexplained variance in each group were also given. The table indicated that while about 25.4% of the households in the region had demands above the average, 74.6% of the households had demands below the average. Among the high demanders, 3.1% of the households in the region had extremely high demands for secondary care institutions of more than 2,500 visits/1,000 (i.e. Group 5). Among the low demanders, 67.5% of the households had extremely low demands for secondary care institutions of less than 70 visits/1,000 (i.e. Groups 10, 26 and 23). The level of precision in predicting this type of demand by the use of the demand model was quite high. Apart from Group 5 which showed a high proportion of unexplained variance (0.321), all the final groups had low proportions of unexplained variance still remaining in them (between 0.001 and 0.066).

B. The Absolute Contribution of the Components

Hypothesis IV of the demand model predicted that the total proportion of variance in demand explained would differ by type of demand. The proportion was expected to be higher in the case of demand for primary care institutions than in case of demand for either intermediate or secondary care institutions. This was found to be the case according to Table 9 - 10. The proportion of total variance explained was 0.387 in the case of demand for primary care institutions compared with

0.347 in the case of demand for intermediate care institutions and 0.362 in the case of demand for secondary care institutions. The hypothesis further suggested that the predisposing need component would be of prime importance for understanding demand for primary care institutions and the enabling components would account for most of the explained variance in the case of demands for either intermediate or secondary care institutions. The findings presented in Table 9 - 10 generally supported this part of the hypothesis as well. The predisposing need component accounted for the larger share of explained variance than all the enabling components together (i.e. 0.202 against 0.185) in the A.I.D. analysis of demand for primary care institutions. In contrast, the analyses of demands for either the intermediate or secondary care institutions show that the enabling components either together or at least one of them accounted for the larger share of explained variance than the predisposing need component. In the case of demand for intermediate care institutions all the enabling components together accounted for a proportion of 0.276 of the explained variance, and the enabling macro-environmental component alone accounted for a proportion of 0.159 of the explained variance against a proportion of 0.071 of the explained variance attributed to the predisposing need component. In the case of demand for secondary care institutions, all the enabling components together accounted for a proportion of 0.223 of the explained variance, and the enabling physical accessibility component alone accounted for a proportion of 0.182 of the explained variance against a proportion of 0.139 of the explained variance attributed to the predisposing need component.

TABLE 9 - 9

CHARACTERISTICS OF FINAL PREDICTION GROUPS IN A.I.D. ANALYSIS OF DEMAND FOR SECONDARY CARE INSTITUTIONS (VISITS/1000/YEAR).

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Secondary Care Inst. (visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) (1) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
5	34	3.1	2 506.5	0.321	Hospital A $<$ 40kms; Secondary care need $\geq$ 250units/1000.
15	86	1.7	1 698.6	0.064	Hospital A $<$ 40kms; Secondary care need $\geq$ 70 $<$ 250 units/1000; Hospital A or no facilities available; Occupation of Head: Skilled, unskilled labourer, clerical employee or no occupation.
21	43	0.7	1 541.1	0.026	Hospital A $<$ 40kms; Secondary care need $<$ 70units/1000; Hospital A or no facilities available; Males $\geq$ 62%.

TABLE 9 - 9

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) ×	Mean of Demand for Secondary Care Inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
14	50	1.4	1 190.4	0.021	Hospital A $<$ 40kms; Secondary care need $\geq$ 70 $<$ 250 units/1000; Hospital A or no facilities available; Occupation of Head: Farmer, farm labourer, merchant or professional or managerial employee.
17	55	5.2	787.0	0.066	Hospital A $<$ 40kms; Secondary care need $\geq$ 60 $<$ 250 units/1000; Dispensary or Dressing station available; Hospital B or C $\geq$ 25kms.

The profit motive in the health service is normally weak. The objective of the service providers is not to acquire profits as is the case in other businesses. For all these reasons the distribution or allocation of medical care on the basis of market principles or for that matter economic theory falls through. A more rational and more nearly optimal distribution of medical care facilities should be planned on the basis of a more comprehensive conceptualization of social policy.

1.2.3 Social Policy Concept

Social policy as it is understood today is a British concept popularized throughout the world through the writings of Evelin Burns, R.M. Titmuss and T.H. Marshall. It is not a clearly defined concept. According to Marshall it is defined as:-(1)

> "Social policy is not a technical term with an exact meaning ... It is taken to refer to the policy of governments with regard to action having a direct impact on the welfare of citizens by providing them with services or income."

According to this definition social policy can be conceived as an independent entity. But it is in fact dependent on the principle of social justice and human equity.

However, Titmuss offers a different concept by defining it as follows:-(2)

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(1) Marshall, T.H. (1965). Social Policy. London: Hutchinson University Library.

(2) Titmuss, R.M. (1950). Problems of Social Policy. London: H.M.S.O. and Longmans Green and Co.

TABLE 9 - 9

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Secondary care inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
25	60	1.4	686.9	0.022	Hospital A $<$ 40kms; Secondary care need $\geq 30 < 70$ units/1000; Hospital A or no facilities available; Males $<$ 62%.
28	30	3.2	402.1	0.014	Hospital A $\geq 40 < 70$kms; In North Blue Nile; Secondary care need $<$ 300units/1000; In rural farm; 17 years and below $<$ 60%.
19	41	4.4	343.0	0.048	Hospital A $\geq$ 40kms; In North Blue Nile; Secondary care need $\geq$ 300units/1000.

TABLE 9 - 9

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) ×	Mean of Demand for Secondary care inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
24	52	1.1	310.0	0.003	Hospital A $<$ 40kms; Secondary care need $<$ 30units/ 1000; Hospital A or no facilities available; Males $<$ 62%.
16	44	3.1	292.5	0.013	Hospital A $<$ 40kms; Secondary care need $\geq$ 60 $<$ 250 units/1000; Hospital B or C, Dispensary or Dressing station available; Hospital B or C $<$ 25kms.
12	49	3.7	180.1	0.005	Hospital A $<$ 40kms; Secondary care need $<$ 60units/ 1000; Hospital B or C, Dispensary or Dressing station available.

TABLE 9 - 9

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Secondary care inst.(visits/ 1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
29	32	3.5	174.4	0.004	Hospital A $\geq 40 < 70$kms; In North Blue Nile; Secondary care need <300units/ 1000; In rural farm; 17 years and below $\geq 60\%$.
23	92	9.9	67.1	0.005	Hospital A ≥ 70kms; In North Blue Nile; Secondary care need <300units/ 1000.
26	59	4.6	59.9	0.001	Hospital A $\geq 40 < 70$kms; In North Blue Nile; Secondary care need <300units/ 1000; In other than rural farm.

TABLE 9 - 9

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Demand for Secondary care inst.(visits/1000) ($\bar{Y}$)	Unexplained variance in Group (Proportion) (1) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
10	739	53.0	36.3	0.025	Hospital A $\geq$40kms; In South Blue Nile or White Nile.

Mean of Demand for Secondary Care Institutions in region = 266.8 visits/1000/year.

x Total does not add up to 100% due to rounding up error.

(1) Unexplained variance in Group refers to the variance within the Group still not accounted for as a proportion of the total unexplained variance in the sample $(TSS)_i/(TSS)_T$ gives the proportion for Group (i).

TABLE 9 - 10

VARIANCE EXPLAINED BY EACH COMPONENT FOR EACH TYPE OF DEMAND.

Component	Proportion of Total Variance in Demand Explained		
	Type of Demand		
	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
Predisposing	0.202	0.071	0.139
Need for Curative Care	0.202	0.071	0.139
Enabling	0.185	0.276	0.223
Demographic Composition	0.013	0.040	0.009
Socio-economic Structure	-	0.008	0.003
Macro-environmental Setting	0.124	0.159	0.029
Physical Accessibility	0.048	0.069	0.182
Total	0.387	0.347	0.362

9.3.0 SUMMARY OF DEMAND ANALYSIS

In this chapter, hypotheses about households' demands for curative care institutions were examined in two sections. In the first section, total demands were studied. A household's total demand was measured in cost-equivalent units which combined both the quantitative and the qualitative characteristics of the demand. The first hypothesis of the general demand model - that a predisposing need component together with enabling deomgraphic composition, socio-economic structure, macro-environmental setting and physical accessibility components would all contribute to the explanation of differences in households' total demands - was generally supported. The correlation analysis showed significant relationships between variables representing each component and total demands. Further, in the A.I.D. analysis which attempted to take into account the causal effect, each of the components was able to account for some variation in total demand.

The second hypothesis - that need would be a stronger predictor of total demand than any of the other enabling components of the model - also received adequate support. Need was shown to have the strongest influence on total demand. The importance of the need component was indicated by both the correlation analysis and the more stringent A.I.D. analysis. However, when the importance of the predisposing need component was compared with the combined importance of all the enabling components, need was not the most dominant contributor to the explanation of total demand in the Blue Nile region. While need accounted for a proportion of 0.170 of the total variance (i.e. 49.1% of explained variance), the enabling components together accounted for a proportion of 0.176 of the total variance (i.e. 50.9% of explained variance). This evidence reflects to what extent the present curative care facilities in the region are equitably provided. Securing the necessary type of curative care in the region was found to be more the result of situational factors rather than actual needs. Accordingly, the present distribution of curative care as determined by the present demand patterns is far from the ideal distribution,[1] and therefore non-optimally provided.

The findings also suggested specifications of the relationships between the explanatory components of the model and total demand beyond those stated in the original hypothesis. Such specifications showed the relative importance of each sub-component within each component, as well as the relative importance of each index within each sub-component. Such findings will be of great importance in future planning for a more equitable optimal distribution of curative care resources.

In the second section of this chapter separate studies were conducted for the three types of demands which constituted

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(1) i - An Ideal Distribution can be defined as that distribution in which need would account for all the variations in demand in the case when all the variations in demand are explicable (i.e. need accounted for 100% of the variations in demand).

ii - An Optimal Distribution can be defined as that distribution in which need would account for all the explicable variations in demand (i.e. need accounted for 100% of the explained variations in demand).

the total demand. These were demands for primary, intermediate and secondary care institutions. A household's demand for each type of curative care institutions was measured in the yearly visits to each type. These separate studies were necessary because it seemed that household characteristics associated with each type of demand would differ.

The third hypothesis - that the predisposing component would be most important in the case of demand for primary care institutions; that the enabling components would be more important than the predisposing component in the case of demands for either intermediate or secondary care institutions; that the physical accessibility enabling component would be the most important among all the enabling components in the case of demand for secondary care institutions; and that the socio-economic enabling component in particular would be less significant with regard to all types of demand - received adequate support. The correlation analysis showed that the need component had the highest correlation coefficient when demand for primary care institutions was considered. However, this was not the case with demands for either intermediate or secondary care institutions. In the correlation analysis of each of these latter types of demand, variables representing enabling components had higher correlation coefficients than the predisposing component. The A.I.D. analysis indicated that the predisposing need component was relatively the most important component in the case of demand for primary care institutions. It also indicated that the enabling macro-environmental component was relatively the most important component in the case of demand for intermediate care. It also indicated that the enabling physical accessibility component was relatively the most important in the case of demand for secondary care. It also indicated that the socio-economic component was the least important of the components in all cases. Moreover, the A.I.D. analysis specified the relationships between the independent components and the resultant demands further than was mentioned in the general hypothesis. The relative importance of even the sub-components as well as the indices within each sub-component were shown. The prediction tree described the analytical processes in the case of each type of demand, and showed how the rather intricate relationships between needs together with the various situational conditions in the region, and various types of demand could be sorted out. Such details as those provided in the prediction diagrams discussed in the chapter could facilitate the achievement of a more optimal and equitable distribution of curative care facilities at various planning levels.

The fourth and last hypothesis of the model - that the general model would fit more the analysis of demand for primary care institutions than the analyses of demands for either intermediate or secondary care institutions - was also supported. The highest proportion of variance was explained in the case of demand for primary care institutions. Further, need was shown to be of prime importance in the explanation of differences in demand for primary care institutions, while enabling situational conditions were of prime importance in the explanation of differences in demands for either intermediate or secondary care institutions.

These findings indicated that, according to the present regional distribution pattern of curative care facilities in the Blue Nile province, the distribution of primary care institutions (i.e. dispensaries and dressing stations) was the nearest to an ideal distribution since need accounted for 20.2% of the variations in demand. The distribution of secondary care institutions (i.e. Class A hospitals) was found to be next in proximity to an ideal distribution since need accounted for 13.9% of the variations in demand. The distribution of intermediate care institutions (i.e. Class B or C hospitals) was found to be furthest in proximity to the ideal distribution since need accounted for only 7.1% of the variations in demand.

The hierarchy of the distribution of the curative facilities in the region is given in Table 9 - 11 which follows:-

TABLE 9 - 11

HIERARCHY IN THE DISTRIBUTION OF CURATIVE CARE INSTITUTIONS

Rank	Type of Curative Facility	Degree of Proximity to "Ideal Distribution" in percentage	Degree of Optimality - in percentage
1	Primary Care Institutions	20.2	52.2
2	Secondary Care Institutions	13.9	38.4
3	Intermediate Care Institutions	7.1	20.5

> "It consists of acts of governments undertaken for a variety of political reasons to provide for a range of needs, material and social, and predominantly dependent needs that the Market does not or cannot satisfy for a certain designated section of the population."

This last definition recognizes that the market mechanism is the normal mechanism that governs human activity but that when it temporarily fails to do that, social policy can come and rescue that situation. This attitude of market superiority has emerged as a result of the "impressive" accomplishment of economic planning in the capitalist world. Particularly since World War II, the major capitalist countries have discovered that social planning need not diminish freedom or eliminate the market. Social planning was seen as only an integral part of economic planning. It is argued that when economic planning becomes more comprehensive, it tends to be more enveloping for every aspect and eventually it will come to include and provide for social planning.(1) This view has helped to limit the concept of social policy to welfare programmes or to subordinate the policies that shape these programmes to market principles. According to this view social policies are measures for the amelioration of supposedly transitional short-comings of the "self-regulating" free enterprise economy, i.e. the "fall-outs" of economic policy pending adjustment that is hypothesized to result from the constant

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(1) Shonfield, Andrew. (1965). Modern Capitalism: The Changing Balance of Public and Private Power. New York: Oxford University Press.

9.3.1 The Explanatory Power of the Demand Model

The explanatory power of the demand model in relation to total demand as well as individual demands for the three types of curative institutions was much higher than that of the need model. In all cases of demand about 35% or more of the variations were explained. Despite the superiority of the demand model over the need model in explaining the regional variations with respect to medical care demands and needs, quite a lot of the variations (i.e. about 65%) were not explained. This could be attributed largely to limitations of the survey time as well as limitations of the method of collecting the data. If the survey had been conducted for a number of years, a more stable pattern of demands would have been obtained. This would, accordingly, reduce the margin of unexplained variation in demand. The method of collecting information about the number of visits made to different curative institutions during a year, relied mainly on the memory of the respondents. Although attempts were made to encourage the households' members in the sample to keep diaries for the record of their visits, very few households kept such records up to date. Accordingly, a few of the visits made would not have been remembered and reported in the interviews. A more reliable record of visits could have been achieved if more frequent contact with the sampled households was made during the survey year. With a more reliable record of visits to various curative institutions more variance in demand would have been explained.

Among other factors responsible for the low explanatory power of the model is the fact that the analytical unit employed in the model was the household rather than the individual person. Such a unit would tend to ignore all factors of the individual personal behaviour. Because of lack of factors influencing individual behaviour in the model, large unexplained variations would unavoidably be experienced. Such a limitation could probably be overcome by using the individual person as the analytical unit and introducing more factors of individual behaviour. Although the introduction of such new factors might be useful in raising the explanatory power of the model, it would be doubtful if these factors could easily be forecast in planning for future demands. Elements of individual behaviour could also be extremely diverse and no common denominator might be found in which case very little extra variance will be explained by introducing such elements.

The explanatory power of the demand model could also have been increased if the size of the sample had been larger. Quite a few of the final groups in the A.I.D. analyses contained high unexplained variance (i.e. Groups 9 and 13 in total demand analysis; Group 15 in primary care demand analysis; Groups 15, 17 and 25 in intermediate care demand analysis; and Group 5 in secondary care demand analysis). Under the constraint of the present sample size, further splitting of these final groups was stopped mainly to avoid any of the resulting groups having less than a minimum of 30 households. If more sample units were available (i.e. a larger sample), such final groups could have had the chance of further splitting and accordingly, more variance could have been explained.

A larger sample could not have been secured and utilized in view of the researcher's limited time and funds.

PLANNING FOR AN OPTIMAL AND EQUITABLE REGIONAL DISTRIBUTION OF CURATIVE HEALTH FACILITIES, WITH SPECIAL REFERENCE TO THE BLUE NILE PROVINCE OF THE SUDAN.

CHAPTER 10

IMPLICATIONS OF THE STUDY

CONTENTS Page

10.0.0 IMPLICATIONS OF THE STUDY

This chapter discusses the implications of the findings designed to rationalize the regional provision of curative care facilities with special reference to the Blue Nile Province of the Sudan. Rationalization has an important contribution to make to the improvement of the level of health in a developing country. Rationalization in the provision of curative care facilities involves two main features, optimality in the provision of curative care and equity in the distribution of curative facilities. In this chapter, the implications will be discussed under these two headings.

10.1.0 OPTIMALITY IN THE PROVISION OF CURATIVE CARE

In a developing country, medical care is characterized by extremely high medical needs and extremely low medical and financial resources to meet such needs. The consequences of such a situation are:-

1. Greater human suffering and death with their unavoidable impact on productivity and the general level of economic and social development.
2. Greater pressure on existing medical resources with resultant reduction of medical performance and loss of quality in medical care provision.
3. Greater chance for inequity in the distribution of curative care facilities to happen within regions

and between regions with resultant wastage of medical resources in one part and inadequacy in another.

Neither medical nor financial resources can be augmented sufficiently to cope with such high medical needs as those in a developing country, but an escape from this deadlock can be achieved through the reduction of medical needs. Although it is possible to speak of a situation where medical needs can be radically reduced, in practice such a sizable reduction, even if possible, would require great financial as well as other resources far beyond the ability of any country. It is logical, however, to try and minimize the reducible medical needs of the people. Such minimization of needs will provide a basis for optimal medical care provision. It will facilitate the following:-

1. Relief of avoidable human suffering and reduction of premature death with its consequent raising of the productivity levels and increasing human happiness.
2. Relief of demand pressures on existing curative institutions with resultant improvement in the quality of medical performance to those most in need for it.
3. Savings in regional medical resources as well as in financial expenditure on curative care. Such savings may be applied towards upgrading the whole national health care system.

10.1.1 A Policy for Minimizing Medical Needs

As stated earlier, in order to formulate a social policy, it would be logical to view such a policy within the framework of a comprehensive policy system. Accordingly, it would be necessary to formulate a policy for minimizing medical needs in the context of the whole system which creates medical needs. An optimal policy for minimizing medical needs would, therefore, emerge as a result of adjusting other policies (economic or social) in an effort to reduce or eliminate the causes for high medical needs. In order to formulate such a policy, the basic questions to be answered are:-

1. Why do people in the region differ in their medical needs and to what extent? and
2. How can the causes of high needs be removed or moderated?

The need model analyzed in Chapter 8 answers the first question and points to the answer of the second question. This model relates to the distribution of medical needs both in quality and quantity. In the analysis of need, the model assumed three versions each of which was related to a certain level (or quality) of need. These three versions are related to the distribution of needs for primary, intermediate and secondary care. Each of these versions will be used to demonstrate what the effects of an "ideal type" system of comprehensive medical care distribution might be; having to cater for minimum medical needs.[1] This will occur when the effects of the components of the model are minimized or when possible eliminated. The actual effects of these components under the current system of distribution, as determined by the empirical analysis, will then be compared with the effects expected under an ideal type of system of comprehensive medical care distribution. Ways will be discussed of making the causes of the actual variations in needs approximate to the ideal type.

10.1.2 Effects of Components under an Ideal System of Medical Care Provisions

Under an ideal system of medical care provisions, it is not expected that all people's needs for medical care are eliminated, nor is it expected that all people should have similar needs. However, it is expected that under such a system all the reasons that cause some people to have higher medical needs than others, are removed. Table 10 - 1 shows which subcomponents of the need model should have their effects eliminated under an ideal system in which needs for curative care are at their minimum.

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(1) "Ideal type" as conceived by Max Weber is a mental construct. It is formed by accentuation of one or more traits observable in reality. It is a yardstick for analysing concrete situations. It is aslo a limiting concept with which life situations or actions are compared in the process of investigation.

See: Parsons, T. (1947). The Theory of Social and Economic Organization, p.99. New York: Oxford University Rress.

TABLE 10 - 1

EFFECTS OF NEED MODEL SUB-COMPONENTS UNDER AN IDEAL SYSTEM WHERE NEEDS FOR CURATIVE CARE ARE MINIMIZED.

Sub-component	Effects Eliminated
Demographic Composition	
1. Household Size	With respect to need for all three levels of care.
2. Household Sex Composition	With respect to primary and secondary care needs.
3. Household Age Structure	With respect to need for all three levels of care.
Socio-economic Structure	
1. Household Income	With respect to need for all three levels of care.
2. Occupation of Main Earner	With respect to primary and secondary care needs.
Micro-environmental Condition	
1. Room Occupancy	With respect to primary care needs only.
2. Household Facilities	With respect to primary and secondary care needs.
3. House Sanitation	With respect to primary care need only.
4. House Cleanliness	With respect to primary and secondary care needs.
5. Quality of House Structure	With respect to intermediate care need only.

growth of the national product.

This subjugation of social planning to economic planning, in addition to the fact that many human goals and objectives cannot be adequately expressed in economic terms, plus the fact that economic techniques of evaluation are not absolutely transferable to social evaluations, has resulted in concern among sociologists who were driven to question the validity of such thinking. Instead they preferred to view social policy completely in isolation and independent of economic policy. To them social policy and economic policy can co-exist independently of each other. The core function of social policy is conceived as the reduction and eventual elimination of social inequalities through the re-distribution of resources and social opportunities.

However, Gill[(1)] has criticized both these conceptualizations. He contends that this dichotomy is a result of non-comprehensive attitude to a policy system. He conceives both economic and social policies as parts in a greater "policy system". Problems in a community are considered to be consequences of the existing policy system and therefore the solution to these problems seems to require the appropriate modification of the system in order to bring it to a balanced state. Accordingly, social policies are viewed as potentially powerful instruments for planned, comprehensive and systematic social

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(1) Gill, David G. (1970), "A Systematic Approach to Social Policy Analysis". <u>Social Service Review</u> (Dec), 44, 411.

TABLE 10 - 1

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Sub-component	Effects Eliminated
Macro-environmental Setting	
1. Sub-region	With respect to need for all three levels of care.
2. Residence	With respect to need for all three levels of care.
3. Mass Inoculation	With respect to need for all three levels of care.
4. Regular Rubbish Collection	With respect to need for all three levels of care.
5. Regular House Spraying	With respect to intermediate care need only.
6. Regular Female Adult Education	With respect to primary and secondary care needs.

Household Size

The smaller the size of the household is, the greater the needs for both primary, intermediate and secondary care will be. This is largely due to economical as well as psychological reasons. Under an ideal system in which such needs are kept to the minimum, household sizes should be large. In order to eliminate the effects of size on needs for both primary and secondary care, households will require a minimum of 8 persons. In the case of needs for intermediate care, the minimum desirable size is only 5 persons. The achievement of such desirable minimum sizes will have greater impact on needs for primary care than needs for either secondary or intermediate care. Also, it will have a greater impact on needs for secondary care than on needs for intermediate care.

Household Sex Composition

Sex composition has influence only on the extent of needs for both primary and secondary care. Accordingly, the elimination of the effects of this sub-component will not have any impact on needs for intermediate care. Females have greater needs for both primary and secondary care than males. This may be due to females having more unhealthy living conditions than those of men. Under an ideal system, an elimination of the causes that make females more needy than males will have a greater impact on needs for primary care than on needs for secondary care.

Household Age Structure

Household age structure has influence on the extent of all three types of need. The greatest impact is on needs for secondary care and the least impact on needs for intermediate care. In the Blue Nile Province some people under 40 years of age and particularly those under 18 years of age have greater needs for primary, intermediate and secondary care than those above 40 years of age. The reason for low needs as reported by the above-forties could be due to their indifference to their health conditions or to their erroneous interpretation of what constitutes a disease. To such old people, mild conditions of ill-health are probably not consdered to be disease. If that be the case, needs for curative care will have to be augmented rather than minimized under an ideal system. On the other hand, the reason for high needs as reported by those under 40 years of age could be due to a more unhealthy living style adopted by the younger generation than by the older one. If that be the case, needs will be minimized by eliminating the causes for these unhealthy living styles among those under 40 years of age and particularly those under 18 years.

The results of the analysis also show that some people over 18 years of age have greater needs for both primary and secondary care than those under 18 years. The results also show that some people over 40 years of age have greater needs for secondary care than those under 40 years. Under an ideal system, an elimination of the causes for such high needs in these age groups would minimize the extent of their needs for both primary and secondary care.

Household Income

Household income has direct influence on the extent of all three types of needs for curative care. Its impact on needs for intermediate care greatly outweighs its impact on needs for the two other types. The smaller the household income is, the greater the need for all types of curative care will be. Under an ideal system in which such needs are kept to the minimum, households in the lower income groups will have their incomes raised. In order to eliminate the effects of income on needs for both primary and secondary care, each household will require a guaranteed minimum yearly income of LS 300. In the case of needs for intermediate care, the minimum desirable yearly income is only LS 150.

Occupation of the Main Earner

The type of occupation of a household's main earner has influence only on the extent of needs for primary and secondary care, none on needs for intermediate care. The greatest impact will, however, be on needs for primary care. Households where the main earners are farmers have greater needs for primary care than those where the main earners are in another type of occupation. On the other hand, households where the main earners are either skilled labourers or clerical employees have greater needs for secondary care than households with main earners in any other type of occupation. It is probable that the high needs associated with such occupations are largely due to low social status caused by lack of adequate incomes.

Household Level of Awareness

In general the household awareness level conducive to low needs for curative care has not been detected in the analysis of the need model. None of the indices representing awareness level showed any significance. Accordingly, there are no effects to be eliminated in order to minimize needs for curative care under an ideal system.

Room Occupancy

Room occupancy has an influence only on the extent of need for primary care, and that comparatively small. Accordingly, an elimination of the effect of this sub-component will have no impact on needs for either intermediate or secondary care. The higher the room occupancy is, the greater the needs for primary care will be. The effects of overcrowding on health, particularly relative to infectious diseases are well established. Under an ideal system, no household will have a room occupancy greater than two.

Household Facilities

The availability of household facilities has almost similar influence on needs for both primary and secondary care. Its influence on intermediate care has not been detected. Households where separate kitchens are reported to be available have greater needs for both primary and secondary care than those where separate kitchens are not available. This is probably due to poor kitchen conditions in parts of the region. Under an ideal system, such undesirable kitchen conditions will be aliminated. Accordingly, needs for both primary and secondary care will be eliminated.

House Sanitation

Sanitation has influence only on needs for primary care, and that comparatively small. Its influence on needs for either intermediate or secondary care has not been detected. Households with bad sanitation as evidenced by inadequate drainage of waste water, are reported to have greater needs for primary care than those with good sanitation. Under an ideal system, the effects of bad sanitation will be removed. Accordingly, needs for primary care will be minimized.

House Cleanliness

Lack of house cleanliness as evidenced by the presence of loose animals within the house surroundings has some but comparatively weak influence on needs for both primary and secondary care. Its influence on needs for intermediate care has not been detected. Under an ideal system, the effects due to such lack of cleanliness will be removed and, accordingly, needs for both primary and secondary care will be minimized.

Quality of House Structure

The quality of house structure has some but comparatively low influence on needs for intermediate care. Its influence on needs for either primary or secondary care has not been detected. Households living in houses made of thatch or reeds are reported to have greater needs for intermediate care than those living in houses made of mud, bricks or concrete. Under an ideal system, the effects of poor quality housing will be removed and, accordingly, needs for intermediate care will be minimized.

Sub-region

The type of sub-region has almost similar influence on all three types of need. Households in either North or South Blue Nile sub-regions are reported to have greater needs for primary, intermediate and secondary care than those in White Nile. Also households in North Blue Nile have greater needs for the three types of care than those in South Blue Nile. The reason for such high needs in North Blue Nile could be due to the unhealthy malarious physical environment created by the predominant open canal irrigation system which encourages the spread of water-borne diseases. On the other hand, the reason for high needs in South Blue Nile, could be due to low socio-economic as well as unfavourable attitudes towards health and health care. Under an ideal system, such reasons will be removed and, accordingly, needs for primary, intermediate and secondary care will be minimized.

Residence

The type of residence has almost similar influence on all three types of need. Households residing in rural-farm settlements are reported to have greater needs for primary, intermediate and secondary care than those residing in urban, semi-urban or rural-non-farm settlements. Also, households residing in urban and semi-urban settlements have greater needs for intermediate care than those residing in rural-non-farm settlements. The reasons for high needs in rural-farm settlements are probably due to unhealthy living styles and unfavourable attitudes towards the pursuit of curative care. On the other hand, the reasons for high needs for intermediate care in urban and semi-urban settlements are due to the increase of social contrasts and the ease by which contageous diseases can spread in urbanized communities. Under an ideal system, the reasons for high needs in these communities will be removed and, accordingly, needs for primary, intermediate and secondary care will be minimized.

Curative Environment

Curative environment, as represented by the availability of the various curative facilities discussed under the need model, has no detectable influence on needs for primary, intermediate or secondary care. Accordingly, no effects need to be removed under an ideal system.

Public and Preventive Health Environment

Public and preventive health environment has the strongest influence on all types of needs. However, its influence on needs for intermediate care greatly outweighs its influence on needs for either primary or secondary care. Households residing in settlements where no regular mass inoculation is carried out have greater needs for primary, intermediate and secondary care than those residing in settlements where regular mass inoculation is carried out. Also, households in settlements where no regular rubbish collection is carried out have greater needs for the three types of care than those in settlements where regular rubbish collection is carried out. Also, households in settlements where no regular house spraying or fumigation is carried out have greater needs for intermediate care than those in settlements where such spraying is carried out. Under an ideal system, the effects due to lack of these facilities will be removed and, accordingly, needs for the three types of care will be minimized.

Social Welfare Environment

Only female adult education among all the indices of the social welfare sub-component has influence on needs. Its influence is comparatively small and limited to needs for primary and secondary care. Households in settlements where no regular female adult education is carried out have greater needs for both primary and secondary care than those where there is regular female adult education. No influence on needs for intermediate care is detected. Under an ideal system, the effects of this sub-component will be removed and, accordingly, needs for both primary and secondary care will be minimized.

Under an ideal system of medical care provisions, average household needs for primary, intermediate and secondary care in the region would approximate to the needs of those final groups in the analysis which have the lowest needs at present. This implies that the regional average for a household's needs for primary care will be reduced from 4,559.2 units/1,000 to 1,952.3 units/1,000, i.e. a reduction of 57.1% on the present level. Needs for intermediate care will be reduced from 1,136.7 units/1,000 to 502.6 units/1,000, i.e. a reduction of 55.7% on the present level. Needs for secondary care will be reduced from 145.3 units/1,000 to 57.6 units/1,000, i.e. a reduction of 60.4% on the present level (see Table 8 - 4, Group 44; Table 8 - 8, Group 20; Table 8 - 12, Group 40).

10.1.3 Actual Effects of Components

The above discussion has indicated those effects in the model of household needs that would be removed under an ideal system minimizing needs for all three types of care. In the following discussion actual causes of variation will be compared with this ideal system. It is beyond the scope of this present dissertation to present coordinated plans for making the actual more like the ideal. However, some policy guide lines for reducing the influence of certain sub-components will be considered. It should be remembered that the reduction of the influence of the sub-components will be aimed at the optimum although not attaining the ideal in the provision of curative care facilities. It should also be remembered that the implementation of some of these policies may not result in any or immediate reduction in needs if they are not directed towards the appropriate households as defined by the intervening situational conditions which are determined by the analysis. Such undirected implementations of policies may also result in wastage of financial and human resources. In order to reduce the actual effects of the components with a view to optimizing provision, four categories of policies are suggested. These are:-

1. Policies to reduce the effects of the demographic composition;
2. Policies to reduce the effects of the socio-economic structure;
3. Policies to reduce the effects of the micro-environmental condition; and
4. Policies to reduce the effects of the macro-environmental setting.

change, rather than merely reactive measures designed to ameliorate in a fragmentary fashion, specified undesirable circumstances.

This comprehensive conceptualization is particularly important to the concepts of this study. The optimal distribution of medical care will be achieved through a comprehensive appreciation of the total health maintaining system including the use of the available health resources. Also this conceptualization of social policy is important in establishing a yardstick by which current methods employed in the distribution of medical care can be evaluated.

The independent conceptualizations of social policy already discussed have had practical results and are largely responsible for two alternative policy developments related to the distribution of medical care, namely universal and selective policies of medical care distribution.(1)

1.2.4 Universality and Selectivity in Medical Care Distribution

The idea of the universal policy of distribution in medical care stems from the principle of equity and social justice. The National Health Service in Britain is an example of an implemented universal policy. It implies that all citizens or members of a community should be given an equal chance of gaining the benefits of medical care services. Accordingly, the

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(1) Hoshino, G. (1969), "Britain's Debate on Universal or Selective Social Services". Social Service Review (Sept), 43, 245.

Each of these categories are discussed below:-

1. Policies to Reduce the Effects of the Demographic Composition on Needs

The demographic component accounted for a large proportion of the explained variance and, accordingly, an implementation of policies directed towards reducing its effect would lead to considerable reduction in needs for all types of care. The proportions were 35% in the case of needs for primary care, 20% in the case of needs for intermediate care and 31.4% in the case of needs for secondary care.

In order to reduce the actual effects of demographic composition on needs, policies directed towards widening the scope of health education campaigns in the region and making them more effective will require to be followed. Such action will certainly influence health or illness behaviour especially for females as well as those under 40 years and those under 18 years of age. Moreover, policies directed towards encouraging the maintenance of the traditional system of extended families, at least for the time being and especially in urban areas will help in promoting large households. The disintegration of the traditional extended family system as a result of urbanization pressures without a substitute of public social security measures is certainly one of the causes for many ill-health conditions for many people in the region. The implementation of such policies will help in making the causes of actual variation approximate to the ideal situation in which needs for curative care are minimized.

2. Policies to Reduce the Effects of the Socio-economic Structure on Needs

The proportion of variance attributed to the socio-economic component in the case of needs for either primary or secondary care was not great (i.e. 7.3%, 5.8% respectively). However, this component accounted for 19.4% of the explained variance in needs for intermediate care. Accordingly, an implementation of policies directed towards reducing its effects will lead to some modest reduction in needs for curative care and especially those needs for intermediate curative care.

In order to reduce the actual effects of the socio-economic structure on needs, policies directed towards raising the levels of income for low paid people is called for. The target for household income should be set at a minimum of LS 300. Moreover, policies directed towards changing the occupational structure in the region are essential. In most cases the effects of poor occupational structure on needs are through associated low incomes or low educational status. Accordingly, basic changes in incomes and educational levels of farmers, skilled labourers as well as clerical employees and their families would help in making the sources of actual variations approximate to the ideal system in which needs for curative care are minimized.

3. Policies to Reduce the Effects of the Micro-environmental Condition on Needs

The proportion of variance attributed to the micro-environmental conditions in the case of needs for intermediate care was extremely low (3.3%). However, the component accounted for comparatively higher proportions in the case of needs both for primary (11.4%) and secondary (9%) care than in the case of needs for intermediate care. Implementation of policies directed towards reducing the effects of this component will lead to some modest reduction in needs for both primary and secondary care.

In order to reduce the actual effects of the micro-environmental condition on needs policies directed towards the improvement of housing conditions will require to be followed. Such improvement would include reducing room occupancies by making it possible for overcrowded households to build more habitable rooms. Other housing measures would include improvements in kitchen standards and drainage of domestic waste water, maintenance of clean house surroundings and improvements in the standards of houses particularly those built in thatch or reeds. The implementation of such minimum housing policies is an essential condition for the reduction of the causative factors of excessive needs for curative care in the region, particularly with respect to primary and secondary care.

4. Policies to Reduce the Effects of the Macro-environmental Setting on Needs

The proportion of variance attributed to the macro-environmental setting was extremely high in relation to all types of need. This component accounted for 57.3% of the explained variance in the case of needs for intermediate care, 53.8% of the explained variance in the case of needs for secondary care and 46.3% of the explained variance in the case of needs for primary care. Accordingly, an implementation of policies directed towards reducing the effects of this component would result in considerable reductions in needs for all types of curative care in the region.

Policies directed towards reducing the actual effects of this component would include preventive and public health measures such as extending the scale of regular mass inoculation to cover most settlements especially those in rural areas, finding proper ways for regular disposing of domestic rubbish in all settlements, and carrying out regular campaigns of house spraying or fumigation. Moreover, they should include measures to counteract the causes of sub-regional variation. In North Blue Nile such policies would include some programmes for eradicating malaria and other water-borne diseases and mosquito fighting. In South Blue Nile policies directed towards raising the standard of living are more relevant. Also, regular programmes of health education would help. More effective programmes for health education are in fact essential for all types of residential settlements. Policies for increasing the scale of female adult education are also called for. The implementation of such policies would lead to reductions in the effects of this component. It would ultimately result in considerable reduction in all types of need and thereby make the actual sources of variance approximate the ideal situation for the provision of curative facilities.

In sum, this dissertation shows that much of the variations in household needs for various levels of curative care in the Blue Nile Province of the Sudan are explained by effects that could be minimized under a system of optimum curative care provisions.

The above discussion suggests the complexity and multitude of policies involved in reaching an optimum provision of curative care facilities. There is no single way of achieving this. Rather some combinations of policies and approaches to their implementations are called for.

10.2.0 EQUITY IN THE DISTRIBUTION OF CURATIVE FACILITIES

In developing countries, shortage of medical care resources, inadequacy of interregional transport facilities, lack of knowledge about health and illness in addition to unfavourable attitudes towards modern medicine are among the main reasons for the maldistribution of curative care facilities. The consequencies of such maldistribution are:-

1. Lack of social justice and human equity;
2. Wastage of scarce medical care resources on less needy with resultant denial of the benefits of medical technological advances for others in greater need for them.

Equitable distribution of curative care facilities is, therefore, part of a rational policy in the provision of medical care. Equitable distribution of curative facilities does not mean that all households receive the same amount of health services regardless of their needs for them. On the contrary, need is the most essential criterion by which equity in the distribution is judged.

The receipt of curative care in most cases is voluntary and is dependent on the willingness of the people to make the necessary demands to the appropriate curative institutions. Due to lack of specialized knowledge on the part of the medical care consumer on the appropriateness of his decisions, such demands would have to be adjusted in such a way as to fit in with the community's objective for an optimal and equitable curative care provision. Such adjustments mean that some unjustifiable demands would have to be minimized while others more valid would have to be maximized so that a distribution more in harmony with people's needs would be achieved.

10.2.1 A Policy for Equitable Distribution of Curative Facilities

As already stated, in order to formulate a more rational medical care policy, such a policy should be viewed within the framework of a comprehensive policy system. So, an optimal policy for equitable distribution will be reached within the context of the whole policy system which shapes the demands for curative care institutions. A policy for equitable distribution would emerge as a result of appropriate adjustments in the complimentary policy sub-systems which constitute the whole system. The basic step towards such adjustments would start by answering the following two questions:-

1. Why do people in the region differ in their demands for curative institutions, and to what extent?; and
2. How can the causes of differences be manipulated in order to achieve a more equitable distribution?

The demand model analysed in Chapter 9 answers the first question and provides the basis for answering the second question. This model relates to the distribution of demands for various levels of curative institutions. In the analysis the model assumed three versions each of which was related to demands for a certain type of curative institutions, i.e. primary, intermediate and secondary care institutions. Each of these versions of the demand model will be used to describe what the effects of an ideal type system of equitable distribution of curative institutions might be. The thesis is that the effects on each type of demand would be maximized for the predisposing component of the model and minimized for the enabling components. Actual effects of these components under the current system of distribution as suggested by the analysis will then be compared with the effects expected under an ideal type system of equitable distribution. Ways will be discussed to make the causes of actual variations in each demand approximate to the ideal type.

10.2.2 Effects of Components under a System of Equitable Distribution

Table 10 - 2 shows which sub-components of the model should have maximum influence on demands for various types of curative institutions and which should have minimum influence under an ideal system of equitable distribution. Although it is theoretically possible to suggest the elimination of the effects of the enabling factors on demand under an ideal system, in practice such a suggestion might prove not only impossible but also undesirable in certain respects.(1) Accordingly, it is suggested that the effects of such enabling factors should be minimized rather than eliminated where such restraint

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(1) Fuchs, V. (1967). The Basic Forces Influencing Costs of Medical Care: A Paper presented at the Meetings of the National Conference on Medical Care Costs. New York (June).

TABLE 10 - 2

EFFECTS OF DEMAND MODEL SUB-COMPONENTS UNDER AN IDEAL SYSTEM OF EQUITABLE DISTRIBUTION.

Sub-components	Effects
Predisposing Need Sub-components	
1. Need for Primary Care	Maximized with respect to demands for Primary Care Institutions only.
2. Need for Intermediate Care	Maximized with respect to demands for Intermediate Care Institutions only.
3. Need for Secondary Care	Maximized with respect to demands for Secondary Care Institutions only.
Enabling Situational Sub-components	
1. Household Size	Minimized with respect to demands for Intermediate Care Institutions only.
2. Household Sex Composition	Minimized with respect to demands for Secondary Care Institutions only.
3. Household Age Structure	Minimized with respect to demands for all types of institutions.
4. Household Income	Minimized with respect to demands for Intermediate Care Institutions only.
5. Occupation of Main Earner	Minimized with respect to demands for Secondary Care Institutions only.
6. Sub-region	Minimized with respect to demands for both Primary and Secondary Care Institutions.

TABLE 10 - 2

...CONTINUED

Sub-components	Effects
7. Residence	Minimized with respect to demands for Secondary Care Institutions only.
8. Curative Environment	Minimized with respect to demands for all types of institutions.
9. Distance to Curative Institutions	Minimized with respect to demands for all types of institutions.

distribution of facilities can be so arranged that all members of the community have no constraining barriers in securing medical help. The facilities provided would be of a stand-by nature in order to fulfil what Weisbrod[1] calls "Option Demand". In considering constraining barriers in distribution, the stress is often on the financial side.[2] Availability and accessibility are not given consideration as constraining barriers, nor is attitude as to the securing of medical help when needed.[3] Even ignoring these limitations, this universal distributional policy presupposes that all individuals in a community may have similar needs and hence individuals should receive an equal opportunity for the satisfaction of needs. In a wider regional context, the need variation may be so great as to jeopardize the concept of economic efficiency. If accessibility and availability were allowed to enter into the picture the question of economic efficiency would be in even greater jeopardy since neither population density nor transport facilities are equally distributed throughout. This, in addition to scarcity in medical care resources especially in the developing world, will cause much misdirection of effort which will lead

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(1) Weisbrod, Burton A. (1964), "Collective Consumption Services of Individual Consumption Goods". Quarterly Journal of Economics (Aug), 78:3, 471.

(2) Abel-Smith, B. and Titmuss, R.M. (1956), The Cost of The National Health Service in England and Wales. Cambridge, England: Cambridge University Press.

(3) Butterfield, W.J.H. (1968), Priorities in Medicine. London: The Nuffield Provincial Hospital Trust.

would avoid undesirable reactions elsewhere. An ideal equitable distribution of curative facilities means that the specific needs for curative care have the maximum impact on demands while the discretionary enabling conditions have the minimum impact on such demands. A more detailed consideration of each sub-component follows:-

Need for Primary Care

Need for primary care is the most dominant criterion for distributing primary care institutions, given an ideal equitable distribution. Accordingly, the greater the needs for primary care are, the greater the demands for primary institutions will be. Under such an ideal equitable distribution the effects of needs for primary care are maximized to such an extent that resulting demands for this type of institutions are almost equivalent to the needs for them; i.e. needs for primary care account for almost 100% of the explained variance. Under the current system of distribution such needs account for only 52.2% of the explained variations in demand for primary care institutions.

Need for Intermediate Care

Need for intermediate care is similarly the most important criterion for distributing intermediate care institutions, given an ideal equitable distribution. Accordingly, the greater the needs for intermediate care, the greater the demands for intermediate care institutions would be. Under an ideal equitable distribution, the effects of need for intermediate care are maximized to such an extent that resulting demands for this type of institution are almost equivalent to the needs for them; i.e. needs for intermediate care account for almost 100% of the explained variance. Under the current system of distribution such needs account for only 20.5% of the explained variations in demand for intermediate care institutions.

Need for Secondary Care

Need for secondary care is similarly the most important criterion for distributing secondary care institutions, given an ideal equitable distribution. Accordingly, the greater the needs for secondary care, the greater the demands for secondary care institutions would be. Under an ideal equitable distribution, the effects of need for secondary care are maximized to such an extent that resulting demands for this type of institution are almost equivalent to the needs for them; i.e. needs for secondary care account for almost 100% of the explained variance. Under the current system of distribution such needs account for only 38.4% of the explained variations in demand for secondary care institutions.

Household Size

Household size only influences demands for intermediate care institutions. This influence is minimized under an ideal equitable distribution because it is largely independent of need, according to the demand model. Its influence on demand is mainly through enabling characteristics. The smaller the household size, the greater the demands for intermediate care institutions would be. It is pointed out that not all demands for intermediate care will be increased through minimizing the effects of size on demand. The analysis shows that households living in settlements where a Class B or C hospital exists are making over-demands on these available facilities. In such cases it is desirable that households become large in order to minimize the effects of household size on demand. Under an ideal system of equitable distribution almost every household in these settlements will have a minimum of 9 members. On the other hand, the analysis also shows that almost all households living in settlements where a Class B or C hospital does not exist are under-demanding intermediate care. The only exception is when a Class B hospital is nearer than any other hospital in which case there is an over-demand. In such cases, a household of smaller size would be consistent with the reduction of the effects of household size on demand. Under an ideal system of equitable distribution, every household in these settlements would have a maximum of 7 members.

Household Sex Composition

Household sex composition only influences demands for secondary care. This influence is minimized under an ideal equitable distribution because it is independent of need. Its influence on demand is mainly through enabling sex characteristics. Females have lower demands for secondary care than males. The analysis shows that households living within 39 kilometres of a Class A hospital are making over-demands on secondary care institutions. In such a case, it is desirable that males are discouraged from making excessive demands in order to minimize the effects of sex composition on demand. Under an ideal equitable distribution, all males living within 39 kilometres of a Class A hospital will have low demands for secondary care institutions. It should be noted that sex composition has no apparent influence on demands for secondary care institutions when the distance to a Class A hospital exceeds 39 kilometres.

Household Age Structure

Household age structure influences all types of demands; but has the greatest influence on demands for intermediate care institutions (i.e. accounted for 9.2% of the explained variance). Its influence on demands for primary care institutions is rather low (i.e. accounted for 3.4% of the explained variance), while its influence on demands for secondary care institutions is almost negligible (i.e. accounted for 0.3% of the explained variance). These influences are minimized under an ideal equitable distribution because they are independent of needs. People over 40 years and those under 18 years of age have lower demands for primary care institutions than those under 40 years and over 18 years of age. Therefore, under an ideal equitable distribution of primary care institutions, almost all people over 40 years and those under 18 years of age will have high demands for primary care institutions. Also, people over 5 years of age in settlements without a Class B or C hospital and those over 40 years of age in settlements with a Class B or C hospital have lower demands for intermediate care institutions than those under 5 years in the first case and those under 40 years in the second case. Because it is desirable to increase the level of demand for intermediate care institutions in settlements without a Class B or C hospital, people over 5 years should be encouraged to make more demands in order to minimize the effects of age structure of demand. And, because it is desirable to decrease the level of demand for intermediate care institutions in settlements with a Class B or C hospital, people under 40 years of age should be discouraged from making excessive demands in order to minimize the effects of age structure on demand. Therefore, under an ideal system of equitable distribution of intermediate care institutions, almost all people over 5 years of age in settlements without a Class B or C hospital will have high demands for intermediate care institutions, and all people under 40 years of age in settlements with a Class B or C hospital will have low demands for intermediate care institutions. Also, people under 18 years of age in settlements further than 39 kilometres from a Class A hospital have lower demands for secondary care institutions than those over 18 years of age. Because it is desirable to increase the level of demand for secondary care institutions in settlements further than 39 kilometres from a Class A hospital, people under 18 years of age should be encouraged to make more demands in order to minimize the effects of age structure on demand. Therefore, under an ideal equitable distribution of secondary care institutions, almost all people under 18 years of age in settlements further than 39 kilometres from a Class A hospital will have high demands for secondary care institutions.

Household Income

Household income only influences demand for intermediate care institutions. This influence is minimized under an ideal equitable distribution because it is independent of need. Its influence on demand is mainly through enabling characteristics. Income has two contradicting influences on demand for intermediate care institutions depending on whether such facilities are available in the settlement of residence or not. When a Class B or C hospital is available, households with high yearly incomes of LS 700 or more have lower demands for intermediate care institutions than those with low yearly incomes of less than LS 700. On the other hand, when neither a Class B or C hospital is available, households with low yearly incomes of less than LS 300 have lower demands for intermediate care institutions than those with high yearly incomes of LS 300 or more. In the first case, low demands attributed to the high-income households are probably due to financial ability to attain higher quality of care elsewhere as an alternative to intermediate care institution available, which low-income households would not be able to afford. In the second case, low demands attributed to the low-income households are probably due to financial inability to pay for transport costs to make the necessary demands. Because it is desirable to decrease the level of demand for intermediate care in settlements where a Class B or C hospital is available, most high-demand households need to have their incomes raised to a minimum of LS.700 in order to minimize the effects of income on demand. And, since it is desirable to increase the level of demand for intermediate care institutions in settlements where a Class B or C hospital is not available, low-demand households need to have their incomes raised to a minimum of LS 300 in order to minimize the effects of income on demand. Under an ideal equitable distribution of intermediate care institutions, the minimum household income in settlements where a Class B or C hospital exists will be LS 700, and the minimum household income in settlements where no Class B or C hospital is available will be LS 300.

Occupation of the Main Earner

Occupation of main earner only influences demands for secondary care institutions. The impact of this sub-component on demand for secondary care institutions is almost negligible (i.e. accounted for only 0.8% of the explained variance). However, this influence is minimized under an ideal equitable distribution because it is independent of need. The effects of this sub-component are only relevant to households living within 39 kilometres from a Class A hospital. Households whose main earners are farmers, farm labourers, merchants, professional or managerial employees have lower demands for secondary care institutions than those whose main earners have other occupations. High demands attributed to households whose main earners are other than those mentioned, i.e. skilled or unskilled labourers, clerical employees and those without occupations are probably due to low social status resulting from low incomes incompatible with decent standards of living. Therefore, such households could simply be exaggerating their ill-health and misusing the available curative facilities. Since it is desirable to decrease the level of demand for secondary care institutions in settlements within 39 kilometres of a Class A hospital, high-demand households such as those whose main earners are clerical employees, skilled or unskilled labourers will need to be discouraged from making such high demands on secondary care institutions in order to minimize the effects of occupational status on demand. Under an ideal equitable distribution, such households will have low demands for secondary care institutions.

Sub-region

The type of sub-region where the household exists has influence on demands for both primary and secondary care institutions. This influence is minimized under an ideal equitable distribution because it is independent of need. The impact of this sub-component on demands for primary care institutions is greater than its impact on demands for secondary care institutions. While 7% of the explained variance in demands for primary care institutions is attributed to the sub-regional component, only 1.4% of the explained variance in demands for secondary care institutions is attributed to it. Households in South Blue Nile and White Nile-sub-regions have lower demands for both primary and secondary care institutions than those in North Blue Nile. Low demands for such types of curative institutions in these two sub-regions are mainly due to inadequacy of such curative institutions. Under an ideal system of equitable distribution, both South Blue Nile and White Nile sub-regions will have high demands for both primary and secondary care institutions.

Residence

The type of residential settlement in which the household exists has influence only on the level of demands made to secondary care institutions when such institutions are located further than 39 kilometres. The impact of this sub-component on demands for secondary care institutions is extremely low. Only 0.3% of the explained variance in demand for secondary care is attributed to it. However, this influence is minimized under an ideal equitable distribution because it is independent of need. Households residing in urban, semi-urban and rural-non-farm settlements have lower demands for secondary care institutions than those residing in rural-farm settlements. Low demands for secondary care by households in such settlements may be due to their overuse of lower types of institutions which are more accessible to them than the higher types. Since it is desirable to increase demands for secondary care institutions in settlements located further than 39 kilometres from a Class A hospital, households in such settlements need to be discouraged from making excessive demands on the lower types of curative institutions as substitutes for the higher more needed curative institutions, in order to minimize the effects of residence on demand. Under an ideal equitable distribution, households in urban, semi-urban and rural-non-farm settlements located at distances greater than 39 kilometres from a Class A hospital, will have high demands for secondary care institutions.

Curative Environment

The type of general curative facilities available in a settlement has influences on demands for the three types of curative institutions. The impact of this sub-component is extremely high on demands for intermediate care institutions (i.e. accounted for 45.8% of the explained variance), intermediate on demands for primary care institutions (i.e. accounted for 25% of the explained variance), and low on demands for secondary care institutions (i.e. accounted for 6% of the explained variance). These influences are minimized under an ideal equitable distribution because they are independent of need.

In the case of demands for primary care institutions, households living in settlements where a Class A, B or C hospital is available or those living in settlements without any general curative facilities, have lower demands than those living in settlements where either a dispensary or a dressing station is available. The analysis shows that households living in settlements where a higher level of curative institution than a dispensary or a dressing station exists or those living in settlements without curative facilities, need to have their demands for primary care increased in order to minimize the effects of this sub-component on demand. Therefore, under an ideal equitable distribution of primary care institutions, all such households will have higher demands for primary care institutions.

In the case of demands for intermediate care instituto non-optimal distribution of medical care facilities. For such a policy to have full implementation in the developing countries' situation, resources need to be on such a scale as will not and cannot be achievable in such poor nations for a long time to come.

On the other hand, Selective Distribution Policy was born basically in the United States of America where medical services mainly emerged as a direct result of market mechanism. Concern among political groups in that country has led to the idea of selectivity in medical care attainment. It is basically related to the concept of financial barriers as a constraining element in securing the required medical care. Programmes under the Hill-Burton[(1)] scheme and State Insurance Plan for the indigent poor[(2)], are results of such selective policies designed to counter-act the inadequacies of market mechanism in the field of medical care distribution in the U.S.A. Like the universal policy, it fails to deal with the basic issues of availability and accessibility as an integral part of distributional policy.[(3)] The contention is that once the financial barriers are removed, then the medical care distribution would be equitably provided.

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(1) Baney, Anna Mae (1958), "The Nations' Health Facilities: Ten Years of the Hill-Burton Hospital and Medical Facilities Programme (1946-56)". <u>Public Health Service Publications</u>, No.616. Washington, D.C.: U.S. Government Printing Office.

(2) Reed, Louis S. (1947), <u>Blue Cross and Medical Service Plans</u>. Washington, D.C.: U.S. Public Health Service.

(3) Mc Lachlan, Gordon (1967), "Health Services: Public Policy Issues". <u>Medical Care</u> (March-April), 5:2.

tions, households living in settlements where either a Class A or C hospital is available or those living in settlements without a local healer, have lower demands for intermediate care institutions than those living in settlements with a Class B hospital or those living in settlements where there is a local healer. The analysis shows that such households need to have their demands for intermediate care institutions increased in order to reduce the effects of this sub-component on demand. On the other hand, households living in settlements with a Class B hospital need to have their demands for intermediate care decreased in order to minimize the effects of this sub-component on demand. Therefore, under an ideal equitable distribution of intermediate care institutions, households in settlements with a Class A or C hospital or those where there is no local healer, will have higher demands for intermediate care institutions.

In the case of demands for secondary care institutions, the effects of this sub-component are only relevant to households living within 39 kilometres of a Class A hospital. Households living in settlements with a Class B or C hospital or those living in settlements with either a dispensary or a dressing station, have lower demands for secondary care institutions than those living in settlements with a Class A hospital or those living in settlements without any general curative facilities. Since it is desirable to decrease the demands for secondary care for all households living within 39 kilometres of a Class A hospital, those living in settlements with a Class

A hospital or those living in settlements without general curative facilities need to be discouraged from making excessive demands to this type of institution in order to minimize the effects of this sub-component on demand. Therefore, under an ideal equitable distribution of secondary care institutions, such high-demanding households will have lower demands for secondary care institutions.

Distance to Curative Institutions

The distance to the different categories of curative institutions has influence on all three types of demand. The impact of this sub-component is greatest on demands for secondary care institutions (i.e. accounted for 50.3% of the explained variance), intermediate on demands for intermediate care institutions (i.e. accounted for 19.9% of the explained variance), and lowest on demands for primary care institutions (i.e. accounted for 12.4% of the explained variance). These influences are minimized under an ideal equitable distribution because they are independent of need.

In the case of demands for primary care institutions, the distance from the nearest Class A hospital has two conflicting influences on demands depending on whether a dispensary or a dressing station is available or not. In the case where a dispensary or a dressing station is available, the greater the distance to the nearest Class A hospital is, the greater the demands for primary care institutions will be. The greatest demands for primary care institutions occur when the minimum distance to a Class A hospital is 60 kilometres. Since it is desirable to increase demands for primary care institutions for all but the most trivial cases of illness, locating a Class A hospital at a minimum distance of 60 kilometres will minimize the effects of this sub-component on demands for primary care institutions. However, in the case where there is neither a dispensary nor a dressing station in the settlement of residence, the lower the distance to a Class A hospital is, the greater the demands for primary care institutions will be. The greatest demands for primary care institutions occur when the maximum distance to a Class A hospital is 149 kilometres. Since it is desirable to increase demands for primary care institutions, locating a Class A hospital at a maximum of 149 kilometres will minimize the effects of this sub-component on demands for primary care institutions. Accordingly, and as far as demands for primary care institutions are concerned, the ideal location of a Class A hospital is between 60 and 149 kilometres from a settlement.

In the case of demands for primary care institutions, the distance to the nearest Class B or C hospital also has an enabling influence on demands. The greater the distance to a Class B or C hospital is, the greater the demands for primary care institutions will be. The greatest demands for primary care institutions occur when the minimum distance to a Class B or C hospital is 30 kilometres. Since it is desirable to increase demands for primary care institutions, locating a Class B or C hospital at a minimum of 30 kilometres will minimize the effects of this sub-component on demands for primary care institutions.

In the case of demands for primary care, the distance to the nearest dispensary or dressing station also has an enabling influence on demands. Households living in settlements further than 4 kilometres from the nearest dispensary or dressing station have lower demands for primary care institutions than those living in settlements less than 4 kilometres from such institutions. Since it is desirable to increase demands for primary care institutions, the maximum distance for locating a dispensary or a dressing station should be 4 kilometres in order to minimize the effects of this sub-component on demands for primary care institutions. Therefore, under an ideal equitable distribution of primary care institutions, the distance to a dispensary or a dressing station will not exceed 4 kilometres, the distance to a Class B or C hospital will not be lower than 30 kilometres and the distance to the nearest Class A hospital will be between 60 and 149 kilometres.

In the case of demands for intermediate care institutions, the distances to either the nearest Class A hospital or Class B - C hospital influences demand. When either a Class B or C hospital is available, households living further than 39 kilometres from a Class A hospital have lower demands for intermediate care institutions than those living in settlements less than 40 kilometres from such a hospital. Since it is desirable to decrease demands for intermediate care in all settlements having a Class B or C hospital, locating a Class A hospital at a minimum of 40 kilometres will minimize the effects of this sub-component on demand. However, when neither a Class B nor C hospital is available, the greater the distance to a Class A hospital is, the greater the demands for intermediate care institutions will be. The greatest demands for intermediate care institutions occur when the minimum distance to a Class A hospital is 20 kilometres. Since it is desirable to increase demands for intermediate care institutions in all settlements without a Class B or C hospital, locating a Class A hospital at a minimum of 20 kilometres will minimize the effects of this sub-component on demand. Therefore, a minimum distance of 40 kilometres from a Class A hospital will be ideal for maximizing demands for intermediate care institutions for both those settlements where a Class B or C hospital is available and those where such a hospital is not available.

Also, in the case of demands for intermediate care institutions, the distance to the nearest Class B or C hospital has influence on demand. The greater the distance to a Class B or C hospital, the lower the demands for intermediate care institutions will be. The greatest demands for intermediate care institutions occur when the maximum distance to a Class B or C hospital is 19 kilometres. But high demands still occur when the distance to a Class B or C hospital does not exceed 49 kilometres. Since it is desirable to increase demands for intermediate care institutions in all settlements without a Class B or C hospital, locating such a hospital at a maximum distance of 19 kilometres or under no circumstances beyond 49 kilometres will minimize the effects of this sub-component on demand. Therefore, under an ideal equitable distribution of intermediate care institutions, the distance to a Class B or C hospital will not exceed 19 kilometres and the distance to a Class A hospital will not be less than 40 kilometres.

In case of demands for secondary care institutions the distances to either a Class A hospital or a Class B or C hospital have influences on demand. The greater the distance to a Class A hospital, the lower the demand for secondary care institutions will be. The greatest demands for this type of institution occur when a Class A hospital is located at a maximum distance of 39 kilometres. However, demands will still be high at a distance not exceeding 69 kilometres especially in North Blue Nile where transportation facilities are abundant and the journey time is small. Since it is desirable to increase demands for secondary care institutions in all settlements further than 39 kilometres from a Class A hospital, locating such a hospital at a maximum distance of 39 kilometres will minimize the effects of this sub-component on demand. However, and particularly in North Blue Nile, this distance can be extended to 69 kilometres.

Also, in the case of demands for secondary care institutions, the distance to the nearest Class B or C hospital has influence on demand when a Class A hospital is within 39 kilometres. Households living in settlements where the nearest Class B or C hospital is less than 25 kilometres have lower demands for secondary care institutions than those living in settlements further than 24 kilometres. Since it is desirable to decrease demands for secondary care institutions in all settlements within 39 kilometres from a Class A hospital, locating a Class B or C hospital at a maximum distance of 25 kilometres will minimize the effects of this sub-component on demand. Therefore, under an ideal equitable distribution of secondary care institutions, the distance to a Class A hospital will not exceed 39 kilometres and, in North Blue Nile in particular, will not exceed 69 kilometres, while the distance to a Class B or C hospital will not be more than 25 kilometres.

It is evident from the above discussion that ideal locations for Class A, B or C hospitals in relation to each type of curative institutions are not wholely compatible. However, an optimum location which will maximize certain types of demands and minimize others, will not be difficult to attain. Accordingly, under an ideal equitable distribution for all three types of curative care institutions, the distance to a dispensary or a dressing station will not exceed 4 kilometres, the distance to a Class B or C hospital will be around 20 kilometres, and the distance to a Class A hospital will be around 40 kilometres.

10.2.3 Actual Effects of Components

The above discussion has suggested which component in the model of household demands would be maximized and which would be minimized in an ideal system which provides equitable distribution of all types of curative facilities. In the following discussion, some policy guidelines which will make sources of actual variations in curative service use approximate to the ideal type will be discussed. A policy which will make actual demands approximate to ideal demands entails a reduction in the influence of the enabling or the constraining sub-components. Thus, if all the effects of the enabling sub-components in Table 10 - 2 were effectively minimized, the need sub-components would explain a much larger proportion of the variance as a result. However, if needs are reduced demands will automatically be reduced. A reduction in demands will help towards equalization. In order to reduce the effects of the enabling components on demands, four categories of policies are needed. These are:-

1. Policies to reduce the effects of demographic composition on demands;
2. Policies to reduce the effects of socio-economic structure on demands;
3. Policies to reduce the effects of macro-environmental setting on demands; and
4. Policies to reduce the effects of physical accessibility on demands.

Each of these policy categories are discussed below.

1. Policies to reduce the Effects of the Demographic Composition on Demands

The demographic composition component accounted for a much smaller proportion of the explained variance in demands than in needs. However, an implementation of policies directed towards reducing its effects would lead to greater rationalization of demands for intermediate care institutions than for either primary or secondary care institutions. The proportions of variance explained were 3.4% in the case of demands for primary care institutions, 11.5% in the case of demands for intermediate care institutions, and only 2.5% in the case of demands for secondary care institutions.

The policy guidelines already outlined in order to reduce its effects on needs are relevant to the rationalization of demands. More effective campaign of health education would not only improve peoples' health behaviour, but also enlighten them as to which type of care is more appropriate to their needs. Policies directed towards encouraging larger household sizes would also help in reducing the levels of unnecessary demands especially in settlements where a Class B or C hospital is available. Such policies will altimately help in making the present levels of demand approximate those of an ideal system of equitable distribution.

2. Policies to reduce the Effects of the Socio-economic Structure on Demands

The socio-economic component is not at all relevant to demands for primary care institutions and its influence on demands for either intermediate or secondary care institutions is barely significant. This component accounted for 2.3% of the explained variance in demands for intermediate care institutions and 0.8% of the explained variance in demands for secondary care institutions.

Policies for improving incomes and others for improving the occupational rewards in addition to opening new opportunities for work would help in lowering the levels of unnecessary demands to curative institutions. These policies are already important in minimizing needs for curative care. It should be pointed out that sizable reductions in needs will automatically reduce a lot of the demands and, accordingly, will help in making the present levels of demand approximate those of an ideal system of equitable distribution.

3. Policies to reduce the Effects of the Macro-environmental Setting on Demands

The macro-environmental component is nearly as important for demands as it is for needs, especially in the case of demands for both primary and intermediate care institutions. But its importance for demands is due to a different reason from that for need. In the case of demands, the curative environment accounted for almost all the explained variance attributed in the component, while in the case of needs, the public and preventive health environment accounted for almost all the explained variance attributed to the component. The influence of the macro-environmental component is greatest in the case of demands for intermediate care institutions (i.e. accounted for 45.8% of the explained variance), intermediate in the case of demands for primary care institutions (i.e. accounted for 32% of the explained variance), and lowest in the case of demands for secondary care institutions (i.e. accounted for 8% of the explained variance).

Policies to reduce the effects of this component would

Although these two approaches influence the distribution of medical care facilities, their scope is very narrow and limited. A more comprehensive policy is that which allows for two separate but mutually considered notions for setting priorities, i.e. need priority rating and demand priority rating. When the two ratings draw nearer to one another the margin for non-optimality will be reduced. If this goes on until the two ratings are exactly identical, then ideal medical care distribution will be achieved. This is an important concept for the methodology that will be followed in this study.

largely aim at increasing the level of provision of the general curative facilities in specific sub-regions as well as in various types of residential settlements. More dispensaries or dressing stations are needed in most settlements that do not have them, including those settlements which already have different types of hospitals. Such facilities for primary care are even more urgently needed in South Blue Nile and White Nile than in North Blue Nile. Moreover, policies to set up at least one secondary care institution at strategic locations in each of South Blue Nile and White Nile sub-regions are a priority. The provision of these latter institutions plus the former ones in these two sub-regions will reduce most of the sources of variance in demands for both primary and secondary care institutions. It will also indirectly reduce the sources of variance in demands for intermediate care institutions which are now being used as substitutes for secondary care institutions. Such provisions, coupled with some more effective policies aiming at improving the referral system, would make the actual distribution approximate the ideal system of equitable distribution.

4. Policies to reduce the Effects of Physical Accessibility on Demands

Physical accessibility is only represented by the distance sub-component. It has extremely high impact on demands for secondary care institutions since it accounts for 50.3% of the explained variance. Its influence on demands for both primary and intermediate care institutions are moderate (i.e. accounted for 12.4% of the explained variance in demands for primary care institutions and 19.9% of the explained variance in demands for intermediate care institutions).

Policies to reduce the effects of this component on the various types of demands would entail policies for locations of the three types of curative institutions. Ideal locations for the three types of curative institutions have been suggested earlier in this section. A Class A hospital will be ideal if its sphere of influence does not exceed 40 kilometres. A Class B or C hospital will be ideal if its sphere of influence does not exceed 20 kilometres. A dispensary or a dressing station would be ideal if their spheres of influence do not exceed 4 kilometres. Such ideal locations may seem too lavish for a developing country; but if such types of curative institutions are viable propositions in bringing the benefits of modern medical technology close to people in great need for them, such locations are realistic. However, the implementation of such a programme need not be achieved all at once. Gradual implementation and careful phasing for setting up these institutions may be the answer. These standards may remain only as targets rather than immediate requisites for the near future. Any step towards meeting such targets will contribute towards a reduction in the sources of actual variance which will make the distribution approximate to the ideal type of equitable distribution.

In sum, this dissertation shows that much of the variance in household demands for various types of curative care institutions are explained by need factors whose effects are maximized under an ideal system of equitable distribution. However, enabling factors whose effects are minimized under a system of equitable distribution still play an important part in the present situation in the Blue Nile Province of the Sudan.

The discussion in this and the preceding section reflects the complexity involved in the provision of curative care facilities. No simple policy or method will solve the problem. Rather, some combinations of policies and ways of implementing them directed towards minimizing needs while maximizing some demands and minimizing other demands, will contribute to optimum curative facility provision.

10.3.0 FINAL SUMMARY AND CONCLUSION

After a close study of needs and demands in the Blue Nile Province of the Sudan, the implications for the formulation of policies to achieve an optimal and equitable distribution of curative facilities have been discussed. The need model developed in this study identified significant factors of medical care provision in the Province and provided an assessment of their respective effects. In this chapter, their modification to accord with an ideal type system of optimal provision has now been considered. The ideal type system implies that, in face of a developing country's limited resources, the curative services should not be burdened with more than minimum curative needs. This will happen when the effects of relevant sub-components in the three versions of the need model are eliminated. Under such an ideal type system, the adverse effects of the following sub-components are eliminated:-

1. Household Size - with respect to need for all three levels of care.
2. Household Sex Composition - with respect to primary and secondary care needs.
3. Household Age Structure - with respect to need for all three levels of care.
4. Household Income - with respect to need for all three levels of care.
5. Occupation of Main Earner - with respect to primary and secondary care needs.

6. Room Occupancy - with respect to primary care needs only.
7. Household Facilities as represented by Kitchen Availability - with respect to primary and secondary care needs.
8. House Sanitation - with respect to primary care needs only.
9. House Cleanliness - with respect to primary and secondary care needs.
10. Quality of House Structure - with respect to intermediate care needs only.
11. Sub-region - with respect to need for all three levels of care.
12. Residence - with respect to need for all three levels of care.
13. Mass Inoculation - with respect to need for all three levels of care.
14. Regular Rubbish Collection - with respect to need for all three levels of care.
15. Regular House Spraying - with respect to intermediate care needs only.
16. Regular Female Adult Education - with respect to primary and secondary care needs.

The actual effects of these sub-components under the current system of provision, as determined by the empirical analysis of need, have been compared with those under such an ideal system. This has shown that 57.1% of the current primary care needs, 55.7% of the current intermediate care needs and 60.4% of the current secondary care needs, could be effectively removed in the region.

Policies which will modify the causative factors in existing variation in needs so as to approximate to the ideal situation fall into four categories:-

1. <u>Policies to reduce the effects of the household demographic composition on needs</u>

   Policies for widening the scope of health education campaigns and for encouraging extended family systems are indicated here.

2. <u>Policies to reduce the effects of the socio-economic structure on needs</u>

   Policies for raising the level of household income to a target minimum figure of LS 300, for effecting changes in the occupational structure and for raising the educational levels in the region are indicated here.

3. <u>Policies to reduce the effects of the micro-environmental condition on needs</u>

   Policies for the general improvement of housing condition are indicated. Such policies would aim at reduction of high room occupancies, improvements in the hygienic standards of kitchens, improvement in domestic waste water disposal, maintenance of clean house surroundings and improvements in the housing structure.

4. <u>Policies to reduce the effects of the macro-environmental setting on needs</u>

   Policies for increasing the scale of programmes for regular mass inoculation, regular rubbish collection and regular house spraying or fumigation are indicated; as are policies to counteract special causes of sub-regional and residential variations and policies for the introduction of more programmes for female adult education.

The demand model developed in this study, on the other hand, identified significant factors in medical care demand and provided an assessment of their respective effects. In this chapter, their modification to accord with an ideal type system of equitable distribution has now been considered. The ideal type system implies that the demands made on available curative institutions should, as far as possible, correspond to the quantity and quality of needs for them. This will happen when the effects of relevant sub-components (i.e. those related to the predisposing need factors) in the three versions of the demand model are maximized, while other sub-components (i.e. those related to the enabling factors) are minimized or eliminated where possible. Under such an ideal type system, the effects of the following sub-components have been considered for either maximization or minimization:-

1. Need for Primary Care - the effects are maximized with respect to demand for primary curative institutions only.

2. Need for Intermediate Care - the effects are maximized with respect to demand for intermediate curative institutions only.
3. Need for Secondary Care - the effects are maximized with respect to demand for secondary curative institutions only.
4. Household Size - the effects are minimized with respect to demand for intermediate curative institutions only.
5. Household Sex Composition - the effects are minimized with respect to demand for secondary curative institutions only.
6. Household Age Structure - the effects are minimized with respect to demands for all types of curative institutions.
7. Household Income - the effects are minimized with respect to demand for intermediate curative institutions only.
8. Occupation of Main Earner - the effects are minimized with respect to demand for secondary curative institutions only.
9. Sub-region - the effects are minimized with respect to demand for primary and secondary curative institutions.
10. Residence - the effects are minimized with respect to demand for secondary curative institutions only.
11. Curative Environment - the effects are minimized

with respect to demands for all types of curative institutions.

12. Distance to Available Institutions - the effects are minimized with respect to demands for all types of curative institutions.

The actual effects of these sub-components under the current system of distribution, as determined by the empirical analysis of demand, have been compared with those under the ideal type system. This has shown that, under such a system, need for curative care will assume far more importance in explaining demands than has been the case under the current system of distribution.

Policies which will modify the causative factors in existing variations in demands so as to approximate to the ideal situation fall into four categories:-

1. <u>Policies to reduce the effects of enabling demographic composition on demands</u>

   Policies pursued in reducing the effects of this component on needs have been found also effective in this case. Widening the scope of health education and encouraging the setting up of larger households are indicated.

2. <u>Policies to reduce the effects of enabling socio-economic structure on demands</u>

   Here, again, similar policies to those suggested for reducing the effects of this component on needs have been found relevant. Improvements in household incomes and revisions in the occupational structure of the region are indicated here.

3. <u>Policies to reduce the effects of the enabling macro-environmental setting on demands</u>
   Policies for increasing the level of curative facility provisions especially in South Blue Nile and White Nile sub-regions are indicated. Policies for improvement of the referral and transferral systems between various hierarchical curative institutions are also indicated.
4. <u>Policies to reduce the effects of the enabling physical accessibility on demands</u>
   Policies to set targets for location of the three levels of curative institutions are indicated. Such targets are:-
   a. Class A hospitals should not be located at more than 40 kilometres from any settlement.
   b. Class B or C hospitals should not be located at more than 20 kilometres from any settlement.
   c. Dispensaries and dressing stations should not be located at more than 4 kilometres from any settlement.

This dissertation has thus demonstrated that medical needs can be explained by a conceptual model depicting the causal relationships that exist between various components of the environmental setting, physical and social, in which the people live and symptomatic ill-health as a measure of need

1.3.0 SUMMARY AND IMPLICATIONS

In this chapter, the determining factors of medical care provision have been indicated. The scale of medical needs and the technical as well as the financial limitations in meeting such needs in developing countries have been highlighted. Contrasting conceptualizations in formulating policies for the provision of medical care have also been critically appraised.

From this appraisal, it can be concluded that, in order to formulate an optimal social policy in a developing country, a more comprehensive approach to policy formulation is needed. Accordingly, the policy for the provision of medical care should be conceived within the framework of the wider policy system for both economic and social development. At the same time, the policy for the provision of curative care should be conceived within the framework of the wider policy system for total medical care.

In the following chapter, the factors that determine the quantity and quality of hospital care will be discussed.

for curative care. Furthermore, it has demonstrated that demands for curative facilities can be explained by another conceptual model of predisposing components (reflecting medically defined needs) and enabling components (reflecting the impact of various environmental factors, physical and social, which induce need to be expressed in effective demand for the various levels of curative facilities). Moreover, it has demonstrated that the relative importance of respective need components as well as demand components will vary according to the level of the curative facilities concerned. The dissertation has also demonstrated that such models of need and demand are of vital importance to the formulation of comprehensive policies that aim at achieving both an optimal and equitable distribution of curative facilities in a region of a developing country. Accordingly, the proposed thesis of this study has been adequately supported.

PLANNING FOR AN OPTIMAL AND EQUITABLE REGIONAL DISTRIBUTION OF CURATIVE HEALTH FACILITIES, WITH SPECIAL REFERENCE TO THE BLUE NILE PROVINCE OF THE SUDAN.

CHAPTER 2

HOSPITAL CARE DETERMINANTS.

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2.0.0 HOSPITAL CARE DETERMINANTS

Influences related to the hospital are those influences that are determined by the concept of the hospital and its objective, as well as those determined by the hospital components, i.e. doctors, nurses, beds, etc., and their efficiency problems. Their impact on the distribution can be either direct through the limitations they impose on the resources or indirect through the determination of the quality as well as the quantity of the resource utilization.

Utilization of a hospital is normally taken to imply, two basic factors, i.e. the number of patients admitted to a hospital and their length of stay and the efficiency with which the hospital resources and their application are managed.

The first factor, i.e. the number of patients admitted and length of stay, is influenced directly by doctors and their decisions on the interpretation of need for care, the size and the capacity of the hospital. The second factor is largely influenced by the concept of economic efficiency. In this chapter, the hospital influence will be discussed under the headings of hospital goals, doctors' decisions regarding need for hospitalization and the supply and efficiency of use of hospital beds.

2.1.0 HOSPITAL GOALS

To a large degree hospital goals are determined by the hospital doctors. Although in today's hospitals, the organizational responsibility is said to be mutually shared by what is described as the management triangle, composed of the governing board, the administrator and the staff physicians, the role of the staff physicians in decision making in the hospital is unrivalled. According to Gordon(1), this unique feature in the hospital organization which is unparalleled in other organizations, stems from the relationship of the licensed self-governing medical staff to the other partners within the management. This relationship is predicated upon the legal position of the doctor. Since medicine can only be practiced by those qualified to do so, neither the board nor the administrator has much control in the professional practices of the doctors within the hospital.(2) As such, this rather independent status of the hospital medical staff which is protected by professional ethics, shapes hospital activities and sets the main goals for the hospital performance.

The hospital as an institution for conducting medical care, has undergone several transformations in its goals throughout its long history. Although such goals have appeared in historical sequence, each successive goal supplemented rather than displaced the earlier ones.

Earlier goals of the hospital emerged in order to offer service to the community in an indirect way. Earlier,

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(1) Gordon, Paul J.(1964), "Top Management Triangle in the Voluntary Hospital". Hospital Administration (Spring)9:2,46.

(2) Medical World News (1968, May 31). Shaping the Doctors' New Role, p.40 A.

hospitals were established in order to remove unpleasant and dangerous individuals usually with communicable diseases or mental illnesses. The community was protected by the custody of the patients. However, as these earlier hospitals achieved more stability and permanence a second goal started to appear. Hospitals were no longer provided only for the custody of dangerous patients but also for the relief and help to those who need care. As hospitals became more hygienic, physicians discovered that the hospital as a place where diagnosis and treatment could be carried out is far superior to the patients' home or the doctor's office. In this way the hospital goal shifted from meeting a community need to providing a workshop for the doctors to perform community care more conveniently. In this way hospitals developed and started to acquire diagnostic and therapeutic equipment. The doctors started to look at hospitals as places where their requirements could be met in order to carry out efficient medical practice. This aim of efficiency started to grow in dimension. Accordingly, the hospital goal was transformed from providing efficiency to that of providing high quality medical care. It is this goal of providing high quality care which became more dominant and assumed top priority among the other hospital goals.

Originally education and research were introduced in some hospitals because they furthered the basic goal of better patient care. However, an increasing number of hospitals, as experienced from the situation in the U.S.A., seemed to view education and research as a primary goal in its own right, rather than a secondary one.

As the hospitals were becoming the locus of an even greater proportion of the community's health resources, observers began to add yet a new goal to the list, i.e. providing optimum health service for the people. For this reason many individual hospitals tended to view optimum health service to the people as an inevitable consequence of the fulfilment of other hospital goals rather than a primary goal in itself.

It should be noted that there is little evidence that the pursuit of this last goal or the other goals will automatically result in optimum health care for the community. Increasing evidence suggests that as patients' care becomes better and better due to specialization and mechanization, its component parts become more and more fragmented and in effect less and less available to the individual. The people in need of care have difficulty in making effective contact with the complex system so as to find their way to the right place at the right time.

In this way hospitals have tended to concentrate more on the productive process and have relatively neglected the distributional process of health care. Community needs are thought of in terms of patients attending hospitals rather than people needing medical service. The common view seems to be as Sigmond[1] puts it:-

> "If our hospitals provide the best patients' care, the people will come here when they are in need..."

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(1) Sigmond, Robert M. (1967), "Health Planning". Medical Care (May-June), 5:3. Op. Cit.

This seems to amount to an article of faith in the "unseen hand". Moreover, even if the hospital goal was accepted as that of providing optimum patients' care, it is still far from providing optimal medical care. The new emphasis on medical care with all its component parts of preventive and public health and health education etc. as applied to the people, proves that hospital care provides a limited part of optimal medical care only for the people.

As the setting of the hospital goals is becoming far removed from the community's relative needs and distributional patterns, it is likely that the hospital will be far removed from the ultimate goal of medical care, and as such become a non-optimal vehicle for the provision of total medical care.

2.2.0 THE DOCTOR'S DECISION REGARDING HOSPITALIZATION

The utilization of hospital resources is a direct result of the doctor's decision to admit and discharge patients that are willing or able to avail themselves of medical care. However, there could be many who are either unwilling, unable or simply too ignorant to benefit from the hospital resources. For those who avail themselves of his aid, the doctor exercises his decision in accordance with the ethics of his profession. He translates patients' ailments into medical needs and requirements on a purely professional basis according to the means available to him in the hospital to help him make the right judgement. As a result of his judgement, admission to the hospital can be determined provided hospital beds are available. The type of therapy an admitted patient receives depends not only on the type of ailment or its gravity but also on the means the hospital has for the effective treatment of that ailment, i.e. doctors, auxiliary personnel, equipments and drugs. The duration of the patient's stay depends, apart from the nature of the patient's individual case and his response to the type of administered treatments, on the help of the auxiliary staff the doctor gets, i.e. from nurses, technicians, etc. It should be pointed out that the convenience and saving in the doctor's valuable time which enables him to look after a number of patients, depends on the number and quality of the auxiliary staff. The availability of competent auxiliary staff does not only determine the duration of the patient's stay but also the effectiveness of the care the patient gets. Pressures exerted on the doctor and the hospital staff by the influx of more patients needing attention can also influence the duration of the patient's stay and the quality of treatment received. Demand pressure build-up can have its repercussions carried throughout the whole hospital system so as to ultimately determine the quality of medical care attainable in a particular hospital. If, however, pressures were responded to by the supply of extra medical staff, nurses, auxiliaries and drugs, etc., the optimal level of cure and the high quality of patients' care can be maintained.[1]

It has already been pointed out that the supply of medical resources is determined by the general wealth of the country concerned and budgetary constraints, rather than the health condition of the people or the pressure they exert on these resources. Accordingly, demand pressures exerted on the hospital are not likely to be responded to effectively in the case of developing countries. If the doctor decides to maintain the quality of care to its ideal level despite demand pressure, and despite ineffective response from the hospital authority to match this pressure, the result will be a denial of the service to many patients. Those who come first will get treatment, while those who come after will either have to be dismissed without treatment or only get an unsatisfactory level of care. This is not an unfamiliar state of affairs in many

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(1) Silver, G.A. (1958), "Beyond General Practice: The Health Team". Yale Journal of Biology and Medicine (Sept), 31, 29.

poor developing countries, where the supply of hospital resources cannot be augmented to cope with increasing demand pressures.

However, some flexibility can be exercised by the doctor in his decision to admit and discharge patients. Priority can be established in the rating of the different types of diseases and different conditions of patients. Some types of disease are likely to require urgent hospital treatment more than others and within these types some patients' conditions are graver than others. In this way the doctor's decision will be more related to the relative condition of the patients and to the total situation of the whole community's resources, rather than pure pathological grounds.(1)

Demand pressures which influence doctors' decision on utilization of hospital resources can, however, be reduced in many ways. It has been widely confirmed that many diseases and ailments, howadays, do not require hospital treatment.(2) Diseases caused by poverty and malnutrition can be effectively reduced by preventive measures. Other illnesses can be controlled through public health measures, while others can completely be eradicated by merely raising the standard of living of the community. There is evidence that some cheap preventive

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(1) Roemer, M.I. and Shain, M.(1959), Hospital Utilization Under Insurance, Hospital Monograph Series, No.6. American Hospital Association.

(2) Yerby, A., Alonzo S.(1967), "Health Departments, Hospitals and Health Services". Medical Care (March-April), 5:2.

measures can be far more effective in reduction of diseases than any hospital treatment.(1)

Other facilities which are not of hospital origin, like private practitioners, can in a way reduce pressures of demand from hospitals if they are adequately equipped to facilitate advanced treatment and surgery. However, their impact in poorer communities is not likely to be great due to the heavy charges involved. The availability of other medical practices, like osteopathy, witchcraft or other local medical practices, can influence the demand pressures for hospitals favourably or unfavourably, though probably not to a great extent.

So, although the doctor's decision is crucial in determing the quantity and the quality of the medical care that members of the community get, this decision can be greatly affected by many factors, both inside and outside his hospital domain.

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(1) Bridgman, R.F. (1972), "Some Methodologic Problems in Health Practice Research and Planning". International Journal of Health Services (Feb), 2:1.

2.3.0 THE SUPPLY AND EFFICIENCY OF USE OF HOSPITAL BEDS

2.3.1 Bed Supply

It has already been mentioned that the supply of beds among other factors can influence the utilization by its impact on the doctor's decision. Short bed supply can tempt doctors to make premature discharges of patients. On the other hand, an increase in number of beds will allow the admission of patients who were a lower priority in the first case, i.e. patients with less serious illnesses. With continued increase in the supply of hospital beds, there will come a point where all but the most trivial illness, are hospitalized. In this way the number of beds supplied can greatly influence the quality of hospital care to the community. Evidence in the American record of hospitalization reflects this trend very clearly. In today's America, cases like multiple tooth extractions, psycho-pneumonia, epilepsy, diabetes for insulin stabilization are hospitalized when half a century ago more serious cases by todays standards were not admitted to hospitals. Studies in Saskatchewan(1) show that the ratio of hospitalization varies directly with the supply of beds in a local area. Roemer(2) in examining the 1957 data in the U.S.A. has also

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(1) Myers, G.W. (1954), "Hospitalization Experience of a Government Hospital Care Insurance Plan". Canadian Journal of Public Health (Sept), No.45, 372- and (Oct), No.45, 420.

(2) Roemer, M.I., "Hospital Utilization under Insurance",Op.Cit.

found that under almost similar bed occupancy ratios, a high correlation existed between the bed supply of each state and its overall utilization ratio.

2.3.2 Organizational Inefficiency

However, even with a fixed number of hospital beds available, the efficiency with which the beds are used, can greatly influence both the quantity as well as the quality of hospital care to the community. The 1952 Annual Report of the British Ministry of Health[(1)] stated that if the stay of each patient in general hospitals could be shortened by one day, the waiting list created by demand pressure at that time could be eliminated in three years. Similarly, Forsyth and Logan[(2)] in a study for the assessment of future hospital needs pointed out that if the average bed occupancy in England and Wales could be raised from 78% to 90%, 7,000 beds could be saved to cater for additional needs, and if bed occupancy was increased to 95%, 8,500 beds could be saved, i.e. a saving of about 25% of the total beds available.

Inefficient bed use could happen mainly as a result of inefficient hospital organization. This can greatly reduce the average "bed turnover" - a wastage of bed hours and days for which staff and equipment are available but not used.

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(1) Ministry of Health (1953), On the State of Public Health: The Annual Report of the Chief Medical Officer of the Ministry of Health for the Year 1952, Cmnd No.9009, p.191. London: H.M.S.O.

(2) Forsyth, G., Logan, R.F.L. (1960), "Assessment of Future Hospital Needs". Hospital, No.56, 463 and 488.

Wastage of beds days could occur as a result of improper scheduling of diagnostic and therapeutic procedures. It is not uncommon especially in a large complex hospital, for many days to elapse before a patient gets certain examinations, the results of which are needed to determine the course of therapy. Bottlenecks may occur due to an understaffed laboratory or x-ray department or perhaps an overworked or inexperienced nursing staff so that medical orders are not carried out promptly or effectively. Better assessment of staff allocations and training could help to improve the working capacity and efficiency in each hospital department. This would lead to more economical use of beds.

Wastage of bed days could also occur as a result of a doctor's decision due to demand pressures. With large waiting lists for hospital admission, doctors may seize the opportunity to admit patients whenever a bed is free, even if days are required before a patient is ready for therapy. Competition among doctors may aggravate this tendency. Thus, a patient may be admitted for "building-up" a week before surgery - a process which might be done outside the hospital. Or, an elective surgical case may be admitted several days before a busy surgeon can actually schedule the operation in a busy operating room.

Wastage of bed days could also occur as a result of rigid staff working routine. Evidence in many hospitals shows that, weekly admission and discharge ratio have a more regular cycle corresponding to staff routine working hours and days.(1)

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(1) Menerah Medical Centre (1956), Admission and Discharge Data for Hospitals, p.57. Kansas City, MO.

High admission-discharge ratio during the beginning of the working week and lower admission-discharge ratio towards the end of the working week, is obviously not a regular tendency in the occurrence of diseases in a community, but it could rather be an influence of the staff working routine. More balance in the staff working hours to correspond with the patient flows could lead to more efficient use of beds.(1)

2.3.3 Inefficiency due to Improper Judgement of Requirements

Inefficiency in bed usage could also be due to improper assessment of the patient's treatment requirements either through imporper diagnosis or misjudgement in treatment requirement. Although this depends in most cases on technical considerations or diagnostic skills and modes of individual doctors, other considerations related to out-patient care, especially in developing countries, are particularly important. Due to shortage of skilled doctors, most of the preliminary diagnosis which determines the admission, is done by unskilled medical staff whose medical knowledge and skills are limited. This could lead to premature admission, the results of which can be reflected in misuse of the scarce hospital beds. This problem is very difficult to deal with especially in poor nations. More efficiency can, however, be gained by proper training of such medical assistants to improve on their diagnostic ability and judgement skills. In developed countries the situation could be handled differently and could lead to more re-

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(1) Taber, K.W. (1958), "Balancing our Patient-Bed Budget". Pennsylvania Medical Journal (June), No.61, 738.

warding effects. In Britain the general practioners' ability and improved judgement on referral to hospital has been raised considerably through reforms in the old idea of general practice.[1 and 2] The creation of the modern health centres in Britain with the introduction of different skills to form the practice unit is one way towards a prospective efficiency in the use of hospital beds.[3]

Misjudgement in treatment requirements could also be the result of an old worldwide misconception of hospital care. It has already been pointed out that hospital care is not necessarily synonymous with total medical care. Hospital care is only part of the total medical care and many diseases can be cared for more effectively through other forms of medical care or in alternative institutions, i.e. preventive, nursing home or even only through diet improvements. In such cases hospital care as an alternative is only a misuse of scarce hospital resources which lead to inefficiency in bed use. Studies in Boston and New York in the U.S.A.[4] have shown that a high

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(1) Scot, R. and Gilmore, M. (19), Edinburgh Hospitals: Problems and Progress in Medical Care. The Nuffield Provincial Hospital Trust.

(2) Forsyth, G. and Logan, R.F.L. (1968). Gateway or Dividing Line. Nuffield Provincial Hospital Trust, Oxford University Press.

(3) Draper, P., Israel, S. and Mackenzie, S. (1969), "Community Care Units: Educational and Further Staffing Aspects". Journal of the Royal College of Physicians (Jan), 3:2.

(4) Rosenfeld, L.S., Goldmann, F. and Kaprio, L.A. (1957), "Reasons for Prolonged Hospital Stay: A Study of Need for Hospital Care". Journal of Chronic Diseases (Aug), No.6, 144.

proportion of long stay patients do not really need the services of a hospital. Instead they only need nursing care or custodial care such as would be found in a nursing home or old peoples' homes or even just family attendance.

While misjudgement in treatment is a reason for inefficiency of bed use, other bias is caused by private practioners who are either staff in a hospital or who have influence in admitting their private patients for the sake of promoting and gaining better reputation for their own private practice. Such a problem is very real, especially in developing countries and could greatly jeopardize the public interest in a situation of very limited resources. This obviously results in unjustified admissions and as a result inefficiency or misuse of hospital beds.

A problem which has great influence on utilization and accordingly the use of hospital beds is the problem of repeaters. At Amsterdam, Querido revealed the existence among hospital population of a number of repeaters - people with almost a life history of hospital care. Roemer and Myers[(1)] studied the problem of repeaters and found in Saskatchewan that over a five year period a very high proportion of the total hospital days, i.e. 61 per cent, is attributed to a small minority group of patients whose need for full hospital care is obviously a mistake. Such people need care elsewhere and their use of hospital beds jeopardize the interest of the

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(1) Roemer, M.I. and Myers, G.W. (1956), "Multiple Admission to Hospitals". Canadian Journal of Public Health, No.47, 469.

whole community by diminishing the number of beds that could have been used for more needy patients. In Glasgow, Ferguson and Mac Phail[1] have demonstrated that the problem of repeaters is due to inadequacy of after-care services. In their recommendation they suggested that the provision of adequate after-care services not only help these people, but prevent premature re-admission to hospitals with the effect of reducing hospital loads.

2.3.4 Inefficiency due to Patient Categorization

Inefficiency in bed use can also result from rigid hospital compartmentalization and patient categorization. Divisioning of hospital beds according to different specialities may lead to beds in one section being over-used while some are under-used in another section. Although the problem in this case may be due to imbalance in the distribution of specialities, categorization according to speciality may lead to serious difficulties which can impede the attainment of the optimal level of hospital care. Many diseases can be treated by different specialists and are not necessarily the sole domain for one speciality. Such categorization will prohibit the handling of patients on the basis of multiple diagnosis and treatment. This inherent problem in speciality categorization of patients has led many hospital planners to seek better and more efficient alternatives. The authors of "The Hospital Plan for Scotland"

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(1) Ferguson, T. and Mac Phail, A.N. (1954), Hospitals and Community. London: Oxford University Press.

in 1962[1] have suggested that the basis for such categorization should be widened to include several specialities within each category. They suggested that patients' beds could be allocated according to a wider diagnostic basis, i.e. acute maternity, chronically sick, mental patients, mentally deficient, infectious diseases and respiratory diseases. Although such categorization is obviously helpful in overcoming some difficulties inherent in rigid speciality categorization, it is still far from the idea of optimal hospital care. Within such broad categories, many less seriously ill patients are lumped together with many others whose condition is more serious and who would require more than an average type of care. This difficulty was seen by McKeown[2] who suggested that patients should be categorized on the basis of the therapy required rather than the diagnosis characteristics. In this way the extent of hospital resources can be more closely related to the level of treatment needed in each case. In his view, patients could be classified into four distinct groups based on the type of treatment required:-

1. Those in need of full hospital resources, i.e. skilled doctors, etc.
2. Those in need of limited hospital facilities,

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(1) Department of Health for Scotland (1962). Hospital Plan for Scotland, Cmnd No. 1602, p.24. London: H.M.S.O.

(2) McKeown, T. (1958), "Hospital Planning: The Concept of the District General Hospital". Lancet, 1, 702.

i.e. essentially those needing only nursing care and not necessarily specialized doctors' care.

3. Those in need of limited hospital care because of their mental state.

4. Those needing no hospital care but are only kept in hospitals for social reasons.

It has been suggested that such categorization of patients would result in a more efficient use of hospital beds since the quantity as well as the quality of care will correspond with the patients' needs rather than an average type of care for everybody. A later study based on McKeown's idea was conducted by the Nuffield Provincial Hospital Trust.(1) In this study a more efficient use was suggested by grouping patients on the basis of therapy required into six groups:-

1. Intensive therapy: This group would include those who are critically ill. Such a group would require highly specialized equipment, specialized doctors and nursing care.

2. Intensive nursing care: This group would include those whose condition is not very serious but who are not mobile. Such a group would require skilled nursing care day and night in addition to intermittent doctors' care.

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(1) Meredith, J.S., Anderson, M.A., Price, A.C. and Leithead, J. (1968). Hostels in Hospitals. O.V.P. Para. 3, 4 and 5. Nuffield Provincial Hospital Trust.

3. Non-intensive nursing care: This group would need both nursing and medical attention, but to a lesser degree as the patients will be ambulant part of the time.
4. Five-day bed care: This group would only need limited nursing care as patients will be ambulant all the time. Medical attention would also be required but in the form of infrequent doctor's visits and check-ups.
5. Day or 24-hour bed care: This group would include cases for special diagnostic or treatment investigation which can be accomplished in one day. People in this category can be discharged at the end of the day.
6. Supporting bed care: This group would include the following patients:-
   - (i) Predischarge patients
   - (ii) Convalescent patients
   - (iii) Hostel patients, mainly those who are kept in hospital for social reasons.

In this way more efficiency in the bed use can be gained which would result in a more nearly optimal distribution of hospital care both in quantity and quality.

2.4.0 SUMMARY AND IMPLICATIONS

In this chapter, the factors determining the quantity as well as the quality of hospital care have been discussed. These factors arise in connection with hospital goal setting, the doctor's decision regarding hospitalization and the supply and efficiency of use of hospital beds. Relative to these factors tangible improvements to the quality of hospital care to the community can be secured through the following means:-

1. The hospital goals should be set on the basis of the community's need and distributional patterns, bearing in mind the limitations of medical care resources.
2. The doctor's decision on hospitalization should be based on the relative rather than the absolute medical needs of the patients.
3. The efficiency of use of the available hospital beds should be raised through a more rational organization of the hospital activities, better training of hospital staff and more flexible and effective categorization of patients within the hospital.

It may be that still more can be gained through action outside the hospital domain. Improvements in the public health system, the preventive measures and the general standard of living, in addition to the availability of alternative effective private medical practices, will take a sizable load off the hospital shoulders. The hospital will, in this case, be free to provide optimum hospital care to the community.

The hospital activities in the treatment of patients are inevitably conditioned by the quantity and nature of the disease problems which patients present to it. The questions must, however, be asked - Do the problems presented to the hospital properly reflect the problems of the community which the hospital is intended to serve? The patients treated by the hospital originate from some medical need, but how perfectly is need recognized and translated into demand? The concepts of need and demand and their relationship as patient determinants will be discussed in the next chapter.

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CHAPTER 3

PATIENT DETERMINANTS

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3.0.0 PATIENT DETERMINANTS

Important to the utilization of curative resources is the definition of the patient in hospital care. It has already been pointed out that in order that members of the community can secure a share in the hospital resources, they have to be willing or able to avail themselves of the places of care. In this context a patient can be defined as that individual who takes the initial decision of presenting himself for care. Once that step is over, the individual has no discretion as to how much he is likely to have of what is available in the way of diagnosis and treatment. It is all left for the professional opinion of the doctor and his staff. So, it is this initial decision which is an essential element for the rationality of the distribution of medical care to the community.

This initial decision by the individual is determined by many factors, some of which are inescapably related to his health condition and others are discretionarily related to situational conditions. In this chapter these influences will be discussed in relation to two main concepts, i.e. the concept of need for medical care and the concept of demand for medical care.

3.1.0 CONCEPT OF NEED

3.1.1 Need for Medical Care

In view of worldwide limitations in medical resources, the main goal in a Public Health Service is the provision of comprehensive medical care at the lowest possible cost to the community. Programmes intended to meet this goal should seek to assure three elements of effort. Wagner[1] summarized these as:-

"normal development, repair and containment"

According to this statement, three main actions are necessary in a comprehensive medical care system, i.e. prevention, cure and rehabilitation. Although preventive programmes can greatly affect the extent to which cure is needed, and curative programmes can affect the extent to which rehabilitation is needed, none of them can be seen as a complete substitute for the others. Accordingly, the need for medical care can be seen as the need for three different types of programmes simultaneously carried out. But the relative importance of each type of programme in a community depends on the relative contribution of each to the general level of health.

3.1.2 Definition of Health

In order to understand the position of cure within the spectrum of medical care, it is necessary to define health.

The most comprehensive definition is that given in the W.H.O. constitution[2]:-

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(1) Wagner, Carruth J.(1967), "Health Services Research in Public Health Services". Medical Care (Nov-Dec), 5:6.

(2) W.H.O.(1958). Constitution of W.H.O., Appendix I, W.H.O. Geneva: W.H.O.

> "Health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity".

Although this definition conveys the idea that health is much more than just the presence or absence of disease, it suffers from incompleteness by using words whose meaning is not selfevident, such as "complete social well-being", "disease and infirmity". Such words can mean different things to different people. Wylie[1] criticized this definition on the basis that it does not explain what health does to organisms possessing it or how it may be measured. With such a definition it would indeed be difficult to separate healthy persons or communities from those without this quality. First, it requires the exclusion of disease and infirmity and, second, and more difficult, showing that complete physical, mental and social well-being is present. The ambiguity of this definition has led people to think of alternative definitions which can facilitate the measurement of health. Among such definitions is one put forward by Herbert Spencer.[2] Spencer defines health as:-

> "Health is the perfect adjustment of an organism to its environment."

It is implied in this definition that imperfect adjustment causes disorder or illness. It could also be implied that the lack of "physical, mental and social well-being"

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(1) Wylie, Charles M. (1970), "Definition and Measurement of Health and Disease", <u>Public Health Report</u>, 85:2 (Feb).

(2) Spencer, Herbert (1969). <u>Principles of Sociology</u>, èd. Stanislav Andreski, London.

would lead to disorder or disease. Accordingly, it is in terms of disorder or disease that health can be measured. Maurice King[1] confirms this view in his statement:-

> "Extreme sickness and perfect health can be looked upon as forming opposite ends of an evenly graded continuum. Between the full vigour of life on one hand and the final agonies of the dying on the other, there falls, an even spectrum of progressively poor health and steadily increasing illness and disability."

Ffrangcon Roberts[2] has also confirmed this definition by stating that health is the absence of, or ability to resist, disease and death.

3.1.3 Disease and Its Exclusion

During the 19th and early 20th centuries, it was believed that each disease had a specific cause. Diagnosis and treatment were the basic elements in medical care. In recent decades, however, the multiple causation of disease became a more widely held doctrine, a doctrine that recognizes the interplay of host, agent and environment. This has helped greatly in transforming medical opinion as to what is needed in a medical care system. Diagnosis and treatment are no longer the only measures required but prevention and positive action on control of adverse environment can help to reduce disease and thereby ameliorate health. Consequently, such ac-

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(1) King, Maurice,"Medical Care in Developing Countries",Op.Cit.

(2) Roberts, Ffrangcon (1952). <u>The Cost of Health</u>. London: Turnstile Press.

tions can reduce the need for traditional hospital care.

3.1.4 Stages of Disease

Disease is seen to be divided into four stages:-(1)

1. The stage of disease foundation:

   This is the stage of the earlier days before the disease process starts and when the patient begins to acquire adverse habits.

2. The stage of pre-clinical disease:

   This is the time when the health problems develop, but are not producing enough symptoms to send the patient to the doctor.

3. The stage of symptomatic disease:

   This is the stage when the disease becomes worrying and causing inconvenience and might force the sufferer to seek medical help.

4. The stage of continuing chronic disease:

   This is the time when the disease becomes unsusceptible to biological treatment.

A comprehensive medical care system is supposed to offer action at all four stages. Failure to take effective action at the first stage will augment the need for the second stage. If no effective action has been taken in the second stage, the need for action in the third stage will be greater, and likewise in the fourth stage.

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(1) James, George (1967), "Health Services and Community's Needs". <u>Medical Care</u> (March-April), 5:2.

Programmes of public health, health education, social work and other preventive measures can greatly reduce the effects in the first and second stages of disease. Programmes of health education and cure are required in the third stage, and if such programmes are ineffective more will need to be done in the fourth stage. Rehabilitation programmes are required in the fourth stage of the disease. If such programmes were non-existent or ineffective more pressure will be exerted on the curative facilities.

3.1.5 Importance of Curative Programmes

From the previous discussion, cure was seen as an intermediate position in the field of medical care need. Due to many difficulties connected with the efficiency and effectiveness of many programmes of public health, prevention and social work, the impact of such programmes has not been fully appreciated. On the other hand, curative programmes have already demonstrated remarkable achievement more tangible to the people. However, the importance of curative programmes lies in the fact that they can check further deterioration in health when no adequate action was taken in pre-cure states. They also help in reducing the number of cases that might slide into incurable chronics. Because of this complementary nature of curative, preventive and rehabilitative programmes, the need for cure in a community can increase or decrease according to the degree to which pre-curative and post-curative action have been taken effectively.

Although curative programmes seem to be an important ingredient in the total picture of a comprehensive medical system, their role has been undermined by many medical care critics. From a policy point of view, it was stated that curative programmes are short-term measures for dealing with the health problem, while preventive programmes have more permanent effect on the community's health. This is literally true and has additional justification when the vast difference in monetary claims is assessed. Preventive programmes consume far less of resources which are especially scarce in developing countries, than do curative programmes. However, although it is wise in the case of developing countries to stress the importance of prevention, it is unwise to do without curative programmes altogether. On a wide regional basis, it is unlikely that preventive programmes are equitably distributed and accordingly their impact on curative need will be different in different areas. Even in areas where they are provided their effectiveness in reducing disease will also be different for different communities. So, a consideration of need for cure will have to take account of the availability and effectiveness of preventive, public health and social work programmes.

3.1.6 Indicators for Measuring Medical Need

In an effort to measure the health of a population, W.H.O. reports suggested several indicators. Five of such indicators seem to be popular:

1. Expectation of life at birth.
2. Infant mortality ratio, i.e. number of infant deaths per 1,000 live births.

3. Crude annual death ratio, i.e. number of deaths per 1,000 population.
4. Number of hospital beds per 1,000 population.
5. Number of physicians per 1,000 population.

Although each of the above mentioned indicators conveys useful information about the health situation of a population, they do not give a direct measure of health. The first three give a measure of the end result of poor health, while the last two give a measure of means by which health could be improved. They could be a measure of social and political policy rather than the population and its health. Moser[1] realizing the inadequacy of such measures suggested that in order to overcome such a difficulty several indicators should be considered simultaneously before any measurement could be made. In his view health is not one component but several and accordingly its measure should reflect its components. The amount of capital investment, income, improved medical resources and improved health to which such resources are intended to lead are some of the component measures he suggested. He also stressed the importance of the extent to which the resources have been brought within reach of the population groups previously without them. Accordingly, the measurement of health should include three types of measures, i.e. a measure of the resources, a measure of their utilization and a measure of the end effect to which the resources have been used. Moser's treble measure poses a big problem. With three measures of such varied nature

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(1) Moser, C.A. (1957). Measurement of Levels of Living with Special Reference to Jamaica. London: H.M.S.O.

no common denominator can be found in order to compare different communities as far as their health is concerned. Moreover, the first type of measure could be a measure for many things other than health and it could also be the cause for the two other types of measure.

Brotherston(1) tackled the problem differently. He realized that a measure of health in this way could be misleading in priority setting. Instead he pointed to the utility of certain measures of need for medical care which, more precise in themselves, may also indicate unmet need of a more general character. He offered four examples of measures of this type:-

1. The extent of uncorrected visual defects.
2. The extent of undiscovered pre-natal disturbances during pregnancy.
3. The extent of preventable maternal mortality.
4. The extent of uncorrected physical defects and mental disturbance found at medical examination.

Such indicators have evolved as a result of health findings in specific population groups where gaps between need measured in terms of these indicators and realized demand have been observed. Although such indicators might exist over a wide front of medical care, they only convey a partial need limited to those ailments, not necessarily reflecting the total health condition of the population. Moreover, even if such ailments reflect more than themselves, these indicators

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(1) Brotherston, J.H.F. (1962), "Medical Care Investigations". Towards A Measure of Medical Care. London: Oxford University Press, For The Nuffield Provincial Hospital Trust.

would give a measure of unmet need rather than the total need for medical care.

3.1.7 Morbidity as a Direct Measure of Medical Need

Morbidity data have frequently been stated to be an adequate measure of health and as such a direct measure for medical need.(1) Spencer's definition of health previously discussed, confirms that the presence or absence of disease is the only measure for health. In order that morbidity could be translated into a measure of medical need, it requires data on the incidence of the various diseases as well as the mortality rate associated with each disease.(2) It should also cover all types of possible diseases if it is to give a fuller picture of total medical need. Although a mortality connected with each disease can furnish a common denominator for weighing the different diseases against each other and thus enabling priorities to be established for treatment, the degree of suffering caused by each disease is not rated. Some diseases may cause a lot of suffering but not necessarily lead to quick death, while others may reflect no suffering at all, but at the same time lead to quick death. For this reason, priorities established on disease mortality alone may not be

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(1) Lee, R.I. and Jones, L.W. (1933). The Fundamentals of Good Medical Care, p.118. Chicago: University of Chicago Press.

(2) Sullivan, D.F. (1960), "Conceptual Problems in Developing an Index of Health: Vital Health Statistics - Data Evaluation and Methods Research". Public Health Services Publication, No.1000, Series 2, No.17. Washington.

in harmony with the community priorities. James[1] has pointed to such a dichotomy in disease priority between community held views and professional views. For one thing, the money allocations for various treatments and research, do not reflect the death causing criteria. This is a grey area of decision on which generalization is not possible. However, any rating criterion requires some consensus of opinion, whether it should be professional opinion or community opinion or both. Other rating factors could include average hospitalization needs or disability days for each disease as was experienced from past trends.

From the foregoing discussion it can be concluded that morbidity data have a good possibility of furnishing a single measure of health and hence a measure for assessing medical need. However, the success of such information in reflecting an unbiased need in the community depends on how such data are collected and the circumstances in which they are recorded. In most cases morbidity data are extracted from hospital users' reports. While it might be legitimate to rely on such data in the case where hospitals are more available and the population concerned is highly conscious of the benefits of modern medicine and willing to use hospitals, such data might be unreliable as a true reflector of community needs in cases where hospital availability is limited and where people are not willing to use hospitals or are simply unconscious of the benefits of

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(1) James, George, "Health Services and the Community's Needs", Op. Cit.

modern medicine. Such a situation characterizes many developing countries and, accordingly, the reliability of morbidity data in such countries may be doubtful in reflecting peoples' needs. Data on disease incidence collected through clinical surveys are more preferable in such circumstances. In such surveys, the occurrence of disease in a population can be discovered through medical examinations of a sample from a community over a period of time. Many epidemiological studies rely on similar surveys.(1) However, some surveys are nothing but crude assessments of health. They tend to establish a measure based on the concept of normality as determined from biochemical or physical tests.(2) A healthy individual is in such surveys defined as one who has a blood cholesterol below 200 mg/100 ml., or a haemoglobin of some 13.5 - 15.5 g./100 ml., or to be of a particular weight in relation to height and age. Indicators of population health can then be established on the basis of the following indices:-

1. Proportions of all persons and all ages with normal haemoglobin, normal blood cholesterol, normal urinalysis and so on.
2. Proportions of all persons without, for example ova in the stool.

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(1) Miall, W.E. (1955), "Rheumatic Arthritis in Male: An Epidemiological Study of a Welsh Mining Community". Annals of Rheumatic Diseases, 14, 150.

Cotes, J.E., Oldham, P.D. and Thomas, A.J. (1955), "The Prevailence of Coronary Diseases in a Mining Valley". Proceedings of the Royal Soc. of Medicine, 48, 673.

(2) Logan, R.F.L. (1964), "Assessment of Sickness and Health in the Community: Needs and Methods". Medical Care, 2, 173 and 218.

3. Proportions of all persons falling within the normal range of weights-for-height scales.

In mental health, indices are:-

1. Proportions of all persons at various ages and sex achieving a certain score of intelligence tests.

2. Proportions of all persons achieving normal scores of personality judgement.

Such tests so far can only provide an arbitrary standard, a line being drawn at say, the 75th percentile of the distribution. However, more sophisticated measures of need can be assessed through clinical follow-up in determining the existence of different kinds of diseases. Such surveys are usually expensive to conduct on a large scale and especially if all types of diseases are to be investigated for every individual in the sample. Inaccuracy of diagnosis among other management difficulties in conducting them over a long period of time can reduce their effectiveness and, accordingly, render the effort unrewarding.(1)

However, an equally reliable method of assessing medical need in a population can be secured through self-reporting questionnaires in which people are asked if certain known symptoms of diseases are experienced during a certain period of time. Although the reliability of such methods depends on peo-

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(1) Tussel, R.E. and Ellison, J. (1955), "Measuring Need for Medical Care and Related Services". Administrative Medicine: Transactions of the Fourth Conference, ed. Stevenson, p.9. New York: Josiah Macy Jr. Foundation.

ples' response and their willingness to cooperate as well as their memory of the symptoms experienced, studies by Croog,[1] Scotch[2] and Abramson[3] among many have confirmed the effectiveness of such methods. In many of these studies self reporting of illness by questionnaire was said to be highly correlated to the medical needs as assessed by clinical investigations.

3.1.8 Factors Determining Need for Cure

Need represents the most immediate cause for health services' use.[4] Taken by itself, it is unlikely that it will tell very much about the way medical resources are being used. The extent of the medical resources, policies for their efficient allocation, hospital practices and attitudes of the people towards medical help, combine with need in order to determine the way medical resources are being used. Yet need by itself can remain the final arbitrator on which the rationality of medical care distribution can be judged.

It has already been stated that the extent to which cure is needed can be measured by the extent and gravity of diseases. Environment was held to be the main cause for the

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(1) Croog, S. (1961), "Ethnic Origins, Educational Level and Response to A Health Questionnaire". Human Organization, 20 (Summer), 65.

(2) Scotch, N. (1963), "An Index of Symptoms and Disease in Zulu Cluture". Human Organization, 22 (Winter), 304.

(3) Abramson, J. (1966), "The Cornell Medical Index as an Epidemiological Tool". American Journal of Public Health, 56 (Feb), 287.

(4) Friedson, E. (1960), "Client Control and Medical Practice". The American Journal of Sociology, 65 (Jan), 374.

appearance and disappearance of diseases. In an ideal utopian environment, all persons born in the community can be visualized as enjoying good health and happiness from the cradle to the grave and would therefore have no need for medical attention.(1) However, such an ideal environment hardly exists at all. On a wide physical environmental definition, a W.H.O. report refers to various environmental hazards which cause disease.(2) Radiation, air and water pollution and noise are among the most modern environmental hazards held to be responsible for many diseases especially in industrialized communities. Lack of clean drinking water, improper drainage of waste water and improper disposal of solid waste and garbage have been known for a long time to cause health problems especially in poor communities. Other environmental hazards include improper handling, preparing, processing or storing of food stuffs; not to mention bad housing and lack of general sanitation.

The aging process is another phenomenon of our adverse environmental setting. Although it has not been established conclusively how aging works, yet the rate at which the human programmes go to pieces with time seem to be extremely constant. Reinke and Parker(3) in the U.S.A. have shown that a

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(1) Butterfield, W.J.A. (1968). Priorities in Medicine. Op.Cit., p.3.

(2) W.H.O., "Environmental Change and Resulting Impact on Health". W.H.O. Technical Report Series, 292.

(3) Reinke, W.A. and Parker, T.D. (1967), "Measuring the Effect of Demographic Variations on Health Service Utilization". Health Service Research, 2:61.

high positive association existed between the age of the population and their morbidity. Swedish planners have recognized this demographic phenomenon in their health planning procedure since 1958.(1) With an aging population, the volume of chronic illnesses is known to increase tremendously resulting in more demands for medical resources.(2) But despite this uniform trend of deterioration with age, the aging process can slacken or increase according to other environmental conditions. Lack of proper nutrition, lack of exercise and the impact of physical and mental stress and strains can lead to more rapid deterioration with the result of increasing illness.

Unlike age, no evidence of uniform tendency of morbidity has been attached to sex differentiation. The fact that females experience more health complaints during childbearing age(3) in addition to the general trend of hospitalization for child delivery in the United States and other developed countries has led to some conclusions that females need more medical care than males. However, statistical evidence in these countries showing higher life expectancy at all ages for

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(1) Engel, A. et.al. (1958). Regionssjukvården: Riskplan för samarbete inom specialiserad sjukhusvård av särskilt tillkallad utredningsman. Stockholm: Statens Offentliga Utredningar.

(2) Commission on Chronic Illness (1956). Chronic Illness in the United States, Vol.II (Care of Long-Term Patients). Cambridge, Mass.: Harvard University Press.

(3) Wadsworth, M., Blaney, R. and Butterfield, W.J.H. (1963). The Bermondsey Health Survey. London: H.M.S.O.

women than for men, reflects the fact that the female sex enjoys a healthier life than their male counterparts.(1) The connection between medical need and sex can be attributed more to other situational factors in the community than directly to sex. Yet, the differing roles of the two sexes in the community are likely to result in some differentiation in need for medical care.

The most publicized influence on need, however, is attributed to the socio-economic environment. Quite a few sociologists are of the opinion that much about health and disease can be explained by social factors. This is because to many of them illness itself is considered to be a social and psychological phenomenon and therefore it cannot be understood or have any meaning without reference to a social context.(2) However, there is enough evidence to show that the way people live greatly determines their health condition.(3) Poverty as a social factor has been known to be the cause of many diseases

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(1) Dickenson, F.G. (1955), "Age and Sex Distribution of Hospital Patients". Bureau of Medical Economics, Bulletin No.97. Chicago: American Medical Association.

Health Information Foundation (1958), "The Changing Pattern of Hospital Use". Progress in Health Services (May), VII:2.

(2) Zola, I. (1964), "Problems for Research - Some Effects of Assumptions Underlying Socio-Medical Investigations", In Gordon, G,. ed., Proceedings, Conference on Medical Sociology and Disease Control, Chicago: University of Chicago-Centre for Health Administration Studies.

(3) Read, Margaret (1966). Culture, Health and Disease. London: Tavistock Publ.

both directly and indirectly. The high incidence of many diseases, like cholera, smallpox, leprosy, plague, rabies, kwashiorkor and tuberculosis in developing countries is more the result of poverty in these communities than the result of a warm climate. Poverty can cause diseases directly through lack of proper nutritious food, lack of proper shelter and a general lack of proper protection against physical environmental hazards. It can also indirectly cause disease through lack of knowledge about proper sanitation and healthy living. Poverty can indirectly cause disease through lack of adequate medical resources both preventive as well as curative. The influence of the socio-economic level is strikingly shown in the exhaustive hospitalization studies of Saskatchewan.(1) Families of low socio-economic status were found to have more frequent and more severe diseases requiring longer hospitalization stays. In a family context, poverty can manifest itself in low personal incomes, poor housing condition or low educational level all of which are said to have a direct bearing on the occurrence and severity of diseases.

Rural-urban differences in the mode of life, sanitation and availability of preventive and curative resources are another social influence on the extent of medical need. A rural way of living has always been characterized by a lower socio-economic status than urban life. Studies have shown that the

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(1) Roemer, M.I., Feader, C.J. and Acker, M.S. (1954), "Medical Care for the Indigent in Saskatchewan". <u>Canadian Journal of Public Health</u>, 45 (Nov), 460 and (Dec), 502.

incidence of disease decreases with urbanization.[1]

Educational level is another socio-economic factor which can influence the medical need. The higher level of health-consciousness associated with higher levels of education influences the people to adopt a healthy mode of living as well as inducing them to seek an early attention to health complaints. Studies of groups obtaining polio immunization and chest x-rays show a high proportion of the highly educated individuals to be seeking these preventive measures even when no personal expenditure is required.[2] Such consciousness linked with educational level reduces the risks of diseases and accordingly the need for medical care.

From the foregoing discussion, it can be concluded that the need for medical care can be influenced by many environmental factors some of which can influence need on a wider front while others can have a limited impact on individual families or on an individual within one family. The role of other medical care programmes of a preventive nature has also been mentioned. But the direct use of available medical resources is determined by other considerations; the apparent need is one of them.

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(1) Anderson, O.W. and Feldman, J.J. (1956). Family Medical Costs and Voluntary Health Insurance: A Nationwide Survey, p.184. New York: McGraw Hill.

(2) Glessen, M.A. (1958), "A Study of the Public's Acceptance of the Salk Vaccine Programme". American Journal of Public Health, 48 (Feb), 141.

Deasy, L.C. (1960), "Socio-Economic Status and Participation in the Poliomyelitis Vaccine Trial". In Sociological Studies of Health and Sickness, ed. Dorrian Apple, p.15. New York: McGraw Hill.

3.2.0 CONCEPT OF DEMAND

In the traditional economic framework, demand for a good or a service involves the relationship between price and quantity. Such a relationship is normally represented graphically by what is known as the demand curve. This curve usually shows that the quantity demanded varies inversely with price. In a purely economic activity, the amount supplied to meet such a demand is strictly determined by the amount of profit attainable. In such a circumstance nobody asks whether people's needs have been met during this process of profit maximization. However, in the case of medical care, it has been stated earlier in the text that profit making is not one of the objectives of medical care provision. The main objective is the maximization of people's health. For this reason the concept of demand in the case of medical service is a different one. Ideally demand (and supply) should approximate to need.

This particular area of concern has been researched widely by both economists and social-psychologists for at least a decade in an effort to assess the factors involved in determining demand for medical care. In a recent review of data by Whorton, Gross and Hill, over sixty studies on demand were discussed.[1] There seems to be very little agreement amongst these studies on the factors or their relative strength that uniquely determines the demand for various health ser-

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(1) Whorton, E., Gross, P. and Hill, D. (1971). Health Care Data for Medical Sciences - Final Report (June), Contract No.HSM 110-70-38. Rockville, Maryland; National Centre for Health Services Research and Development.

vices. The authors of this review have drawn the attention to three major weaknesses in these studies:-

1. With few exceptions most of the studies conducted failed to consider the demand for health services as a form of human behaviour and as such can be analyzed using the same theory and methods that might be employed in the study of voting or work role behaviours.
2. Most studies failed to consider as important the spacial accessibility of the consumers to the available health facilities. Very often this important aspect of demand which has been greatly stressed in geomedical studies(1) has been completely ignored in these studies. The use of aggregate analysis in most of them prohibits the inclusion of such a vital factor.(2)
3. Most studies failed to reach a consensus on what the appropriate unit of study is, whether it is the individual, the family or the community. While the community level is often too large to enable an assessment at lower levels to be made,

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(1) Justaz, H.J. (1968). Geomedical Research: A Contribution to Human Ecology, 21st Intern. Geographical Congress, New Delhi, India.

May, J.M. (1950), "Medical Geography: Its Methods and Objectives". Geographical Review, 40, 9.

(2) Rosenthal, G.D. The Demand for General Hospital Facilities, Hospital Monograph Series, No.14. Chicago: American Hospital Association.

the individual level is too small to allow group behaviour to be assessed. Although the family level seems to be an intermediate stage which can overcome these difficulties, it tends to ignore elements of individual behaviour.

Within these studies, however, two distinct approaches to analysing demand for medical care can be identified; namely the economist and the socio-psychologist approaches.

3.2.1 Economist Approach

This approach stresses the factors through which people can translate their perceived need into economic demand for medical care. Thus, it stresses such factors as family income, health insurance coverage and prices of different levels of health services. Such enabling factors are more relevant to a situation where medical care is provided on a commercial basis, than to a free service. All other factors affecting demand are not considered of importance and are lumped together as "consumer tastes and preferences".

Feldstein(1) developed an economic model to analyse community medical care expenditure patterns by a series of socio-demographic factors reflecting different demand patterns and probabilities of illness and a set of economic factors reflecting the ability of persons, given certain socio-demographic characteristics, to purchase medical care. In the case

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(1) Feldstein, P. (1964), "Demand for Medical Care". In The Cost of Medical Care, Vol.I, p.57. American Medical Association.

of hospital care, dental care and insurance expenditures, these factors were shown to have accounted for almost two-thirds of the variations. For total medical care expenditures, these factors were shown to be still important though their explanatory power was reduced by almost half. An important finding in this study was the fact that the significance of the factors differed according to the component of the medical care analyzed.

Rosenthal(1) using a regressional model was also able to show that demand for general hospital facilities can be assessed from a combination of socio-demographic and economic characteristics. An important finding in this study was the changing importance of the factors through time. Some factors which were important in the United States (the studied area) in 1950 became less important in 1960, while others which were insignificant in 1950, assumed a higher significance in 1960. Rosenthal attributed this shift to changes in people's tastes and preferences as well as increased ability for many people to attain medical care either through rising income level or insurance assistance schemes.

Wirick(2) using a one-way analysis or variance, analyzed a sample of Michigan population in 1958. He viewed the demand for medical care as the demand for separate components of medical care, i.e. doctors, drugs, etc., rather than a

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(1) Rosenthal, G.D. (1964), "The Demand for General Hospital Facilities", Op. Cit.

(2) Wirick, G., (1966) "A Multiple Equation Model of Demand". Health Services Research, No.1 (Winter), p.301.

homogeneous product. The factors considered to have effect on demand were those of physiological need, realization of need, financial resources to implement care, motivation to obtain care and availability of the facility. An important finding in this study was that even though the same factors often explained each component separately their significance differed from one component to the other.

The successive stages in the demand formulation can be summarized as follows:-(1)

1. Existence of psychological or physiological conditions;
2. Perception of the existence of such conditions;
3. Willingness to manage or control such conditions through health care services;
4. Ability to transform need into demand for health care.

Factors classified as "consumers' tastes and preferences" including incidence of disease, intensity of medical needs, level of education and attitudes towards earlier medical care, were expected to influence the consumer actions during the first three stages of the development of demand for medical care. In the fourth stage the consumers were thought to be directed by economic factors such as income, insurance coverage, price of various health services and type of free care available, to demand medical care.

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(1) Theodore, C. (1966). The Demand for Health Care Services, M.Sc. Thesis, Urbana: University of Illinois.

3.2.2 Socio-Psychologist Approach

In contrast to the economist approach, the socio-psychologist stresses the factors which explain the differential perception of need for health services. Thus, this approach emphasizes those factors which the economists normally interpret as "tastes" and "preferences". While such factors are included in the economic approach, their role seems to be less defined than the economic enabling factors.

Within the realm of the economist' "tastes and preferences", the socio-psychologist makes additional distinctions. First, he distinguishes diseases as they might be clinically defined from the social definition of illness. Socially the definition of illness depends on the prevailing concept of normality. Such a concept can vary from one individual to the other or from one family to another or from one community to the other. Margaret Read quotes an Egyptian physician saying:-(1)

> "In rural Egypt, illness must be associated with pain and discomfort, otherwise it is not illness."

Thus, bilharzia and other parasitic infections are not illnesses because they do not cause pain and therefore do not require treatment. The presence of mild ill-health in the rural Egyptian community is accepted as a normal part of life; and if anyone is indisposed or out of sorts with such symptoms as mild fever, headache, cough or diarrhoea, he can be treated by home remedies and no medical help is sought. In some isola-

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(1) Read, Margaret (1966), "Culture, Health and Disease", Op. Cit.

ted Indian communities disease is considered to be related to some supernatural forces and modern medicine cannot cope with such forces. For such communities medical care is simply not demanded under any circumstances.

Moreover, within the realm of social factors, the socio-psychologist sees further need to differentiate the socio-demographic classifications such as education and class from the socio-psychological measures including perception of illness and values and attitudes towards health and illness. Such a differentiation is viewed as one way towards understanding why people of different social classes have different patterns of demand.

Stoeckle[1] considered that three factors are particularly important to the patient's decision to seek medical aid in response to symptoms of disease:-

1. His objective clinical disorder and symptoms as well as his perception, knowledge, beliefs and attitudes about having a particular disorder or symptom;
2. His attitude and expectation of the doctor and the medical service available to him;
3. His definition of "health", "sickness" and when medical help is necessary.

Suchman developed a conceptual model in which he was

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(1) Stoeckle: I., et.al. (1963), "On Going To See The Doctor: The Contribution of The Patient to The Decision to Seek Medical Aid". <u>Journal of Chronic Diseases</u>, 16 (Sept), 975.

able to show that a "causal" sequence linked demographic factors to social group structure and both of these to health status and medical orientation which determined the demand.(1) He concluded that demographic factors and social group structure contributed independently to medical orientation and that both demographic factors as well as medical orientation influenced the source of medical care chosen.

Kriesberg takes the view that any form of human behaviour is congruent with peoples' values and beliefs.(2) Values and beliefs are the result of cultural and situational factors. While the cultural factors are inherited factors which are passed from one generation to the other, the situational factors are short-term influences which depend on the immediate circumstances. According to Kriesberg these situational factors can be both social and non-social. While it is a fact that cultural factors are often the results of past situational factors the present situational factors may in certain cases be powerful enough to offset these influences. In such a case the demand for medical care expressed in behaviour will be wholly influenced by existing situational factors.

3.2.3 Factors Determining Demand for Cure

In whichever way demand for medical care is conceived

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(1) Suchman, E. (1963). Sociology and the Field of Public Health. New York: Russell Sage Foundation.

(2) Kriesberg, L. (1963), "The Relationship between Socio-Economic Rank and Behaviour". Social Problems, 10 (Spring), 334.

the fact remains that a medically defined need does not necessarily lead to an equivalent demand for medical care facilities. Certain constraining or encouraging factors are at work before a medically defined complaint is translated into demand. Although many different studies stress one set of factors more than others, Andersen has confirmed that the importance of each factor is not uniform and can fluctuate from one family to another depending on other circumstances.(1)

In the presence of a medically defined need, demand as measured by the degree of use of curative facilities can be constrained by many factors. The lack of consciousness about disease which is associated with lower educational levels is one powerful constraining factor in the demand for medical care, especially in developing countries. Inaccurate interpretation of need and lack of appreciation for the benefits of modern medicine are often the reason for failing to use available facilities. On the other hand, health consciousness can be carried too far, among certain educated groups. Hypochondriacs have always existed and some form of education may increase their number. Such constraining or encouraging influences can be controlled or moderated through appropriate health educational programmes.

A second determinant of demand which is evident in

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(1) Andersen, R.M. (1968). Families' Use of Health Services: A Behavioural Model of Predisposing, Enabling and Need Components, Ph.D. Thesis, Purdue University, 1968.

some studies is the size of the family or household. The existence of a greater number of family members not only offers alternative facility but also implies family responsibility tending to reduce demand.(1) Marital status in many studies has revealed some similar influences. For the same age levels, persons who are single, widowed or divorced have higher rates of demand than persons who are married.(2) This could be due to overconsciousness of lonely persons about their health state, who are therefore prompted to demand medical care. Health education can help to determine when medical help is a necessity.

Although age has been a popular factor in determining utilization through its impact on need, its effect as a constraint to need realization has never been assessed. The fact that younger persons are more mobile than older persons can have profound effects on demand, especially under certain circumstances of facility availability. On the other hand, the presence of young children in a family makes parents more anxious and more worried about children's minor complaints. This encouraging influence has not been properly appreciated in many utilization studies.

Quite apart from their influence on need, low income,

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(1) Rosenthal, G.D. (1964). The Demand for General Hospital Facilities, Op. Cit.

(2) Odoroff, M.E. and Abbe, L.M. (1957), "Use of General Hospitals: Factors in Out-Patient Visits". Public Health Reports, 72 (June), 478.

poor housing and low socio-economic status can have the effect of increasing demand. Such factors render patient care more difficult at home and encourage the use of medical facilities. Cost of medical care in the case of low socio-economic communities can have a constraining effect on demand. However, this effect is non-existent in the case where medical care is provided on a free basis.

One of the most generally recognized constraining influences on demand for medical care is the distance at which the facility is placed in relation to people's homes. Many geomedical studies reflect the negative effect of distance on medical care demand. Studies undertaken in some developing countries revealed that the distance constrains demand for medical care in many ways:-(1)

1. The distance affects people's awareness about the existing medical facilities.
2. It also affects people having information on the effectiveness of treatment.
3. It also affects people's faith in the efficiency of treatment.
4. It also affects people's preference of native doctors to modern medicine.
5. It also affects people's reporting of illness to hospitals.

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(1) Ajaegbu, H.I. and Kusemiju, B.F. (1969). The Distance Factor in Medical Geography, Dept. of Geography, University of Ibadan, Nigeria.

Maurice King's study of health care out-patient attendance in Kenya revealed that 40% of the attendants lived within 5 miles, 30% lived between 5-10 miles and a further 30% lived more than 10 miles.(1) A Ugandan study has shown that the average number of visits per person per year decreases by 50% for each of 2 miles increase in the distance to a hospital; for each 1½ miles increase in distance to a dispensary, and for each 1 mile increase in distance to a first-aid post.

A study of public hospital use in a region in France has shown that the hospitals' ability to attract patients decreased with distance.(2) The effect of distance was found to be varying according to the individual technical level and reputation of the hospital.

Studies by Lubin et.al. stress the importance of time-distance in relation to medical care demand and the planning of hospital facilities.(3)

The monetary and time constraints which are associated with distance from the sources of medical care were studied by Schneider(4) as elements of locational inefficiency.

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(1) King, Maurice (1966). Medical Care in Developing Countries. Op. Cit.

(2) Mizrahi, Mizrahi and Roch (1967), "Les Champs d'action des Equiptements Hospitalier". Consomation XIV, Anne No.2.

(3) Lubin, J.W., Drossness, D.L. and Wylie, L.G. (1965), "Highway Network Minimum Path Selection Applied to Health Facility Planning". Public Health Reports, 80, 771.

(4) Schneider, J.B. (1967). Measuring The Locational Efficiency of The Urban Hospital. Philadelphia: Regional Science Research Institute.

Accessibility to the sources of medical care was recognized in many studies as a constraining factor to utilization.(1)

Despite the constraining trend in distance, its effect on demand for medical care is never uniform or regular for all individuals, families or communities as some locational models may suggest.

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(1) Gödlund, Sven (1961). Population, Regional Hospitals, Transport Facilities and Regions-Planning - The Location of Regional Hospitals in Sweden, Lund Studies in Geography, Series B, Human Geography No.21, The Royal University of Lund, Sweden - Dept, of Geography.

3.3.0 SUMMARY AND IMPLICATIONS

In this chapter two concepts for identifying a patient requiring curative medical care have been discussed - the concept of need and the concept of demand. Various ways of measuring needs as well as demands have also been discussed. Factors influencing the magnitudes of both needs and demands have been considered. In the case of needs, such factors were seen as causations for ill-health and can be broadly categorized into demographic, socio-economic and environmental factors. In the case of demands, need was seen as a motivating factor while other factors like the demographic, socio-economic, environmental and distance factors were seen as situational conditions making it possible for the actual demand to take place. The role of need as only one factor in shaping demand and the role of demand as only a rough indicator of need have been stressed.

It can be contended that, in order to plan for an optimal and equitable distribution of curative facilities, both need and demand should be considered simultaneously. An 'ideal' system of curative care whose objective is to meet all possible medical needs, even though desirable, could be unattainable resourcewise. On the other hand, a more 'practical' system of curative care whose objective is to meet all possible demands without reference to need could be both wasteful and inequitable. Several methods which have been used in planning for the distribution of curative facilities, mostly in developed countries, pursued one or other of these two objectives. In the following chapter some of these methods will be briefly reviewed with the intention of highlighting their common as well as their individual shortcomings in meeting the conditions necessary for an optimal and equitable distribution of curative facilities, especially in developing countries.

CHAPTER 4

PLANNING FOR THE DISTRIBUTION OF CURATIVE FACILITIES

CONTENTS Page

4.0.0 PLANNING FOR THE DISTRIBUTION OF CURATIVE FACILITIES

In an attempt to cater for the future requirements of curative facilities, several planning methods were adopted by various investigators in different countries and different times. A common objective in most of the methods used is the satisfaction of demand for medical care. None of these methods attempted to explore the actual needs that motivate demand. Although in a few instances over-use and under-use were considered, the criteria on which they were assessed were very subjective. The premise in most of these methodologies is that if demand is adequately catered for the need will be adequately met. In the previous discussion, it was stated that in most cases need for medical care is often constrained by many factors from being realized as a demand.(1) Accordingly, the validity of these methods in achieving an equitable distribution is questionable.

Another common feature of the planning methods used is the representation of resources needed by a single item of medical resources, i.e. the hospital bed. Although this is largely a legacy of previous thinking that hospital care is the only type of care needed to cater for the health of the community, many functions in hospital care do not necessarily require the use of a bed and therefore cannot be assessed in terms of a bed. The underlying assumption in these methods is

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(1) See discussion in Chapter 3 - "Demand Concept".

that in all hospitals there is a constant ratio of hospital functions and the number of beds. Previous discussions have shown that there are many other factors that determine hospital functions other than the number of beds available.(1) There are, indeed, other curative institutions where the bed does not exist and accordingly such methodologies are limited in their scope for determining the facilities needed in such institutions.

A third common feature in all the previous planning methods used is the lack of differentiation between various bed qualities in different hospitals. The number of hospital beds assessed by these methods does not reflect the quality of care attainable. It is obvious that not all hospitals deliver similar qualities of care. For example, a one-doctor rural hospital certainly delivers a much more limited range of care than a well equipped big urban hospital with many specialities. Also, an overcrowded hospital of any size delivers a quality of care much inferior to an equal sized hospital where demand pressure is very low.(2) Accordingly, even if demand satisfaction is an acceptable objective in health resource distribution, the facilities assessed by such methods are ill-defined qualitatively.

A fourth defect common to many of the methods is fai-

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(1) See Chapter 2 - "Hospital Care Determinants".

(2) See Chapter 2 - "Hospital Care Determinants".

lure to assess the influence of other forms of medical care available, i.e. preventive and rehabilitative, on hospital care. The complimentary nature of different types of medical care has previously been stressed.[1]

In this chapter, six different planning approaches are discussed in order to identify their individual shortcomings as a useful guide to a more comprehensive approach to optimal distribution of curative facilities.

4.1.0 METHODS BASED ON MORBIDITY

Although the level and structure of morbidity are believed to be among the most important determinants of health resources utilization, morbidity data often have been overlooked in the planning of health services.

In the use of morbidity for planning two sequential steps are to be followed:-

1. To survey the extent and character of the so-called "need" for medical care appropriate to the chosen population, either as perceived by the individual or defined by the professionals;
2. To translate the need defined by morbidity into health resources.

Different researchers have calculated needed health

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(1) See Chapter 3 - "Need Concept".

resources to cope with reported morbidity.[1] Amongst the most detailed is that by Popov from the Soviet Union,[2] reported by Burken.[3] In this study, the investigations included several cities and rural districts in the Soviet Union where experts on delivery of medical care considered that demand for health services was met, i.e. there was no waiting lists for hospitalization and as such the extent of satisfied demand was indicated by the amount of utilization of the health resources. The survey was carried out in two stages. In the first stage, every member of the community was given a card on which all use of medical and hospital facilities was recorded over a period.

Following the utilization stage, a second stage of health examination was carried out on the whole population by medical specialists. According to Burken, the return of this

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(1) Lee, R.I. and Jones, L.W. (1933). The Fundamentals of Good Medical Care, Op. Cit.

Falk, I.S. et.al. (1968), "The Development of Standards for Audit and Planning of Medical Care". Medical Care, 6, 101.

Kalimo, E. and Sievers, K. (1968), "The Need for Medical Care: Estimation on the Basis of Interview Data". Medical Care, 6.

(2) Popov, G.A. Questions of Theory and Methodology of Health Service Planning (in Russia). Moscow: Ministry of Health of the Soviet Union.

(3) Burken, T.E. (1967), "The Estimation of Hospital Bed Requirements", World Hospitals 2: 1, 10.

survey was high, but precise figures were not given. Elderly people were reported to be reluctant to cooperate in such a survey. However, the objective of this massive investigation was to determine the extent of the "iceberg of need" - the submerged as well as the visible parts based on a professional definition of need.[1]

The two surveys were compared and analyzed. Over-use, under-use and misuse of health resources were estimated. In order to make this judgement, standards for use of health resources for different types of morbidity were defined by experts. They calculated the average number of hospital beds required per year per 1,000 population from the following formula:-

$$K = \frac{A.R.P.\ (N + 3\sqrt{N})}{365\ .\ N\ .\ 100}$$

Where K is the Average number of hospital beds required per 1,000 population;

A is morbidity per 1,000 population as assessed from need survey;

R is the percentage of A as judged by the experts to require hospitalization;

P is the average length of stay in days;

N is the average number of currently available beds in all hospitals in the area under survey in a year.

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(1) Logan, R.F.L., "Assessment of Sickness and Health in the Community: Needs and Methods", Op. Cit.

In this mathematical formula, two assumptions are made. The first is, that the number of beds available equals the number of beds demanded. This is obviously not an easy assumption to justify. The second assumption is, that the demand for beds reflecting the number of hospitalizations follow a Poisson's distribution. This assumption is only a speculation.

Among the limitations commonly attributed to methods of estimating potential demand for health services based on a measure of need as determined by morbidity surveys and defined by expert standards are the following:-

1. The methods use for planning the highly subjective concept of need instead of the more objective one of demand. The fact that need exists does not imply that it will be expressed as demand for services.
2. Adequate morbidity data are scarce. In review of morbidity statistics in 98 countries, Smith has demonstrated that such statistics are not available.[1] The main reasons for such a scarcity is the high cost of obtaining reliable morbidity information. It should be noted that though in many cases morbidity information is collected from hospital reports, such reported morbidities are cha-

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(1) Smith, A. (1967), "Morbidity Statistics - A Report on Current Practice in Member Countries of W.H.O.: Report of the 11th Meeting of the Expert Committee on Health Statistics; Report No.H.S./W.P.60.1, p.28. Geneva: W.H.O.

racterized by bias towards those who use hospitals.

3. These methods require a consensus of medical opinion on how best to care for a health condition. This consensus is difficult if not impossible to reach in some cultural environments.

4.2.0 METHODS BASED ON MORTALITY

In assessing the required health resources, some authors have preferred to plan on the basis of mortality data rather than morbidity.(1) One reason for such a preference is that mortality statistics are more reliable than morbidity. Death is a clear-cut criterion of poor health, while disease definition has a very wide margin between its upper and lower limits. Another reason for such a preference is that mortality data are available annually for most localities and in most countries, while morbidity data, even if available, lack this definition of area. A third reason for this preference is that when morbidity data are available, the translation of such morbidity into health resources required, has to rely on such a vague notion of expert opinion.

The assumption made in all planning based upon mortality data is that there is a constant ratio of health resources utilization to mortality. However, technological, demographic and socio-economic changes, among others. condition changes in utilization as well as changes in mortality and hence the validity of the hospital bed utilization to mortality. Mortality itself is a very poor index for health need. Mortality can hap-

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(1) Elliot, E.B. et.al. (1946). Hospital Resources and Needs. New York: The W.K. Kellog Foundation.

Commission of Hospital Care (1947). Hospital Care in the United States. New York: The Common Wealth Fund.

pen as a result of many catastrophies which have no relation whatsoever to the health of the community. Even as a measure of health need, it may reflect only the ultimate end of bad health which should have been looked after earlier.

4.3.0 METHODS BASED ON UTILIZATION

Methods based on utilization form the more recent approach to health facility planning. Basically, the present use of the facilities is taken as a reliable indicator of the use in the future. The objectively quantifiable concept of demand is preferred to the subjective notion of need.

Within this approach two closely related concepts must be considered:-

1. Adequacy of resources: Sufficient facilities must be available to meet the demand.
2. The distribution and coordination of the resources: The geographic and functional relationship between resources and people must be considered effectively.

Within this approach three types of methods can be identified, i.e. methods based on demand, methods based on area comparability, and methods based on analysis of demand.

4.3.1 Present Demand Approach

These methods rely upon exploration of the present ratio of resources to population as conditioned by the present use which is assumed to be adequate. On the basis of this ratio, the number of future resources, i.e. number of beds, doctors, nurses, etc., can be calculated by future population projections.

Bane estimated the future number of physicians needed in the United States using such a method.[1] The American National League of Nursing has also estimated future nursing requirements by this method.[2] Other studies have used the same method for the planning of wider ranges of medical care resources.[3]

It should be noted that these methods only take into account increased demand due to demographic numbers. It assumes that work loads carried in the past and present are the most objective guide to the future requirements. Sometimes this demand is corrected to exclude "over-use" and include "under-use" in accordance with expert judgement. The main reservation to this correction, however, is that definitions of "over-use" and "under-use" are matters of opinion and depend on the criteria selected for judgement. They may only reflect value judgement regarding the purpose of the health resources in question.

Bailey introduced the concept of the critical number of beds which has been widely used in Britain.[4] The method is illustrated by the following hypothetical utilization experience for a general hospital by a population of 10,000 for a

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(1) Bane, F. (1959), "Physician for a Growing America". Report of the Surgeon General's Consultant Group on Medical Education, P.H.S. Publication No.709. Washington, D.C.: U.S. Government Printing Office.

(2) National League of Nursing (1957). Nurses for a Growing Nation. New York.

(3) U.S. President's Commission on Health Needs of the Nation (1953). Building America's Health. Washington, D.C.: U.S. Government Printing Office.

(4) Bailey, N.T.J. (1956), "Statistics in Hospital Planning and Design". Applied Statistics, 5, 146.

one year period:-

1. Satisfied Demand - Actual Admission 1 070

2. Discharge 1 047

3. Total Demand for Hospitalization - Actual Admission + Waiting List 1 094

4. Desired Change in Waiting List

   To meet all unsatisfied Demand; i.e.

   (3) - (1) 24

5. Average Length of Stay in Days 16.3

6. Bed Patient Days; i.e. (5) x (2) 17 066

The critical number of hospital beds for a population of 10,000 is calculated by the following formula:-

$C = D \times S$

Where <u>C</u> is the critical number of beds.

<u>D</u> is the daily demand for hospitalization.

<u>S</u> is the average stay in the hospital.

In the foregoing experience

$$C = D \times S = \frac{1\ 094}{365} \times 16.3 = \underline{47.2 \text{ beds}}$$

In order to determine the desired occupancy rate, i.e. the total available hospital beds for the occupied hospital beds; Bailey(1) and McPhee(2) divided the hospital admissions

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(1) Bailey, N.T.J. (1956), "Statistics in Hospital Planning and Design", Op. Cit.

(2) McPhee, J. (1965). <u>Application of Statistics to Hospital Planning and Management</u>. Dept. of Social Medicine, University of Edinburgh.

into elective and non-elective, i.e. emergencies. In their studies they observed that elective admissions tended to follow a normal distribution.(1) They defined the occupancy rate by choosing a desired turnover interval, i.e. the average number of days a bed is vacant between successive hospital admissions. In the case of non-elective admissions they considered that they follow a Poisson's distribution.(2) Accordingly, they chose the occupancy rate from prepared tables on "variation" of beds required based on a Poisson's distribution. Drossness and associates, however, discovered in their studies of hospital census in Santa Clara County, California, that a normal distribution gives a more accurate description of the variations in the daily census than the Poisson's distribution.(3)

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(1) Normal distribution is governed by the following formula:-

$$Y = \frac{1}{\delta\sqrt{2\pi}} \cdot e^{-\frac{(x-\mu)^2}{2\delta^2}}$$

where μ and δ are the mean and standard deviation respectively; π and e are constant having 3.1416 and 2.7183 approx. Y is the height of the ordinate for a given value of X. A normal variable X which is normally distributed with mean μ and standard deviation δ may be transformed into standard normal variable by the following formula:-

$$Z = \frac{X - \mu}{\delta}$$

(2) Poisson's Distribution Probability is given by:-

$$P\ (x) = \frac{m^x e^{-m}}{X}$$

where e is the base of natural logarithms and is equal to 2.7183 approx.; and m is the parameter of the Poisson's distribution. The Poisson's distribution has only one parameter, m, which is the mean of the distribution and the variance as well.

(3) Drossness, D.L. et.al. (1967), "Uses of Daily Census Data in Determining Efficiency of Units"; Part I and II. Hospitals, 41:45, 65.

Planning based on these methods of extrapolating into the future, past and present demand experience, has been criticized because it not only maintains the status quo but it also magnifies the size of its defects. Another shortcoming of such methods is that they do not take into account shifts in demand related to socio-economic changes in the population or to scientific and technological developments in medicine.

A further reservation has been created by Roemer and Shain's findings that supply appears to promote demand,(1) and accordingly any assessment of demand based on existing supply is superficial. In fact, Roemer's argument on this point has become so generally accepted that it has sometimes been referred to as a "law".(2) Although Rosenthal(3) and Sigmond(4) questioned Roemer's point it is in fact clear that a larger number of hospitals result in a smaller average distance between patients and hospitals, but at a decreasing rate. So the provision of more hospitals creates new demand at an ever decreasing rate; a new hospital in an area where the hospital density is already high, can hardly be expected to generate the same demand as the first hospital in the area. This increase in demand is supposed to continue on being created

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(1) Roemer, M.I. and Shain, M. (1959). Hospital Utilization under Insurance, Op. Cit.

(2) Polner, W. (1960), "Community Forces that can Increase Hospital Utilization by Aged Persons". Wisc. Medical Journal, 59 (Oct), 681.

(3) Rosenthal, G. (1964). The Demand for Hospital Facilities, Op. Cit.

(4) Sigmond, R.M. (1967), "Health Planning", Op. Cit.

until the addition of a new hospital does not produce any further increase in demand, i.e. in the case of optimum distribution.(1)

4.3.2 Comparative Approach

The comparative utilization methods are similar to the methods based on demand previously discussed in all respects except in the choice of where the ratio of resources to population is taken from. The comparative method takes the ratio of resources to population from an area where health resources are considered adequate to satisfy demand, and applies these to other populations.

These methods suffer from the same defects as the previous type of methods. In addition these methods have two more shortcomings. In the first place very few areas or regions are truly comparable. Airth and Newell(2) took the example of two districts that had equal number of inhabitants, similar incomes, similar housing conditions, similar geographical location and morbidity patterns. Their concern was whether the number presenting themselves to hospital care would be similar. Their experiment did not show any similarity in hospital use. In their conclusions, they attributed this di-

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(1) Klaassen, L.H. (1968). Social Amenities in Area Economic Growth. Paris: Organization for Economic Cooperation and Development.

(2) Airth, A.D. and Newell, D.J. (1962). The Demand for Hospital Beds, p.75. Newcastle: Kings College.

vergence to differences in attitudes and habits of both people and doctors in the two areas. This makes one wonder whether comparability of areas ever exists.

A second shortcoming of such methods is to be expected because the concept of adequacy in itself, is very controversial. If the test for adequacy is meant to be that the services should be able to meet demand then such adequacy is vague according to the points Roemer has already brought out. Even if such a definition of adequacy is justifiable now it is unlikely that it will remain so in some twenty years to come. The growth of medical knowledge adds continually to the number of treatments. The standards that were regarded as adequate a few years ago are certainly not acceptable as adequate today.

4.3.3 Analysis of Demand Approach

A more sophisticated approach than the simple extrapolation to the future either of present demand or of ratios of resources to population is that based on analysis of present demand. This approach represents the market analysis of consumer use. Brooks and associates predicted future demand by multiple regression analysis of 117 variables such as demographic data, mean life expectancy, mean effective buying income, average length of stay in hospital, average occupancy rate, ratio of physicians to population and others.[1] Monthly

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(1) Brooks, G.H. et.al. (1964), "A New Development in Predicting Hospital Bed Needs". International Nursing Review, 1, 33.

figures are collected for each of these variables for five years, and multiple regression techniques are applied to establish the relationship between the number of patients in each hospital department and the 15 or 20 most important factors. The number of patients expected per month in each department can be predicted by estimating the values of the factors for that month. The number of beds needed by departments or by the whole hospital is estimated by multiplying the number of patients per month by the average length of stay, and dividing by the average number of days in a month.

Feldstein and German used two methods for predicting future hospital needs. In the first method they extrapolated present supply and demand.(1) In the second they estimated population growth, and analyzed selected socio-economic factors that were assumed to affect utilization. By predicting the future level of these factors they derived estimates of future hospital utilization.

Reinke and Parker have developed a new analytic method, i.e. the "multi-sort" technique that improves the analysis of the effects of demographic variables on utilization.(2) Multiple regression techniques can be used to analyze effects of demographic variables, but the interactions may be

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(1) Feldstein, P.J. and German, J.J. (1965), "Predicting Hospital Utilization: An Evaluation of Three Approaches". Inquiry, 2:13.

(2) Reinke, W.A. and Parker, T.D. (1967), "Measuring Effects of Demographic Variables on Health Service Utilization", Op. Cit.

overlooked entirely or inadequately identified. The analysis of variance has proved useful in handling interactions, but uneven distribution of observations among cells created orthogeniality. However, the multisort is an approximation procedure that simplifies computation while maintaining the analysis of variance approach.

Swedish health planners using this kind of approach based their estimates of the required medical and hospital resources on a demographic analysis of hospital utilization. Because of the polarized age distribution of the country, they are particularly interested in differences in utilization of different age groups. Studies by Engel and associates in 1958,[1] and also those by Höglund and associates[2] in 1966, demonstrate the Swedish approach. It implies the use of an index, i.e. "the consumption unit", which reflects the differences in utilization of health resources by different age groups, rather than persons for estimating future demand.

Navarro outlines the method used in predicting the utilization of services in Göteborg in various years.[3] Table 4 - 1 gives the annual number of consumption units (c.u.)

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(1) Engel, A. et.al. (1958). Regionssjukvården ..., Op. Cit.

(2) Höglund, T. et.al. (1966). Sjukvårdsplan för Göteborg, AB Svenska Telegrambyrån. Göteborg: G.B.G./Tysograpa.

(3) Navarro, V. (1967). Methodology in Regional and Health Planning: A Case Study - Sweden; Department of Medical Care and Hospitals, John Hopkin's University, School of Hygiene and Public Health, Baltimore.

TABLE 4 - 1

ANNUAL NUMBER OF CONSUMPTION UNITS IN THE CITY OF GOTHENBURG (1963).

SOURCE: Swedish Insurance Board Study 1963.

Age Group	Number of Visits per 100 persons (v)	Number of consumption units (c.u.) per person
0 - 15	125.0	0.540
16 - 19	154.0	0.665
20 - 29	196.9	0.850
30 - 39	236.0	1.019
40 - 49	274.9	1.187
50 - 59	311.1	1.343
60 - 66	345.2	1.491
67 and over	308.9	1.334
Mean ($\bar{v}$)	231.6	.....

per person in the city of Gothenburg in 1963.

The mean number of visits ($\bar{v}$) for all age groups is given as 231.6 visits per 100 persons. In order to obtain the consumption units which measure the proportional consumption in each age group, the following formula is used:-

$$c.v. = \frac{v}{\bar{v}}$$

$$\text{i.e. for age group } (0 - 15) \text{ years} = \frac{125.0}{231.6} = \underline{0.540}$$

The total number of consumption units for the whole region can be estimated by multiplying the consumption unit for each age group by the number of people in each age group in the region for the planning years, i.e. 1963, 1970, 1975 and 1980.

By taking into account the differences in consumption of medical services by different age groups, the method gives more detailed estimates based on the growth of the whole population. However, this method pays no regard to other demographic or socio-economic characteristics which can influence the need and accordingly the number of visits. Also, it relies on the assumption that distance from the medical resources has no bearing on the motivation of the visits. Further, the effect of future changes in medical technology was not taken into consideration. For all these reasons, this method seems to equate demand with need. According to previous discussions, it is not likely that demand estimated in this way is a reliable indicator of medical need. However, even if demand can be taken as a reliable approximation of need for health care in a developed country's situation where resources are more available, accessibility to almost any part of the country is not a problem, the awareness of the people about their health and the need to translate their health problems into effective demand is high, such an approximation is not bound to lead to any reliable estimation of need in a developing country's situation where the availability of the resources, accessibility and people's awareness about health or the need to translate them into demands is just the opposite. This demonstrates the limitation of such a method in achieving equitable distribution of health facilities.

4.4.0 METHODS BASED ON DISTRIBUTION

The concept of distribution and coordination as implied in these methods refer to the geographic and functional relationship between resources and the population served. In studying these characteristics, two types of methods have been used, i.e. the facility centred and the population centred approaches.

4.4.1 The Facility Centred Approach

Among studies using this approach are studies by Llewelyn-Davies,[1] Barr and Davies,[2] McKeown and associates[3] and Bridgman.[4]

In this approach, a group of hospitals are surveyed to define the population served by them. This requires the collection of information about hospital discharges according to patients' places of residence for each hospital in the community or region being studied. For each hospital the proportion of its total patients from each area, i.e. county, town-

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(1) Llewelyn-Davies, R. et.al. (1955). Studies in Functional Design of Hospitals, The Report of An Investigation by the Nuffield Provincial Hospital Trust. University of Bristol. New York: Oxford University Press.

(2) Barr, A. and Davies, J.O.F. (1959), "The Population Served by a Hospital Group", Lancet, 2, 1105.

(3) McKeown, T. et.al. (1965). A Balanced Teaching Hospital. London: Oxford University Press.

(4) Bridgman, R.F. (1967). An International Study on Hospital Utilization, Geneva: World Health Organization.

ship or municipality, can be calculated and the percentage of the areas' total population can be estimated. By applying the percentages for each hospital to the total population of each area and adding them, the population served by each hospital in the region can be estimated. By estimating projected changes in the population of these areas it is possible to predict future use and accordingly the required resources.

A shortcoming of this approach is that it does not consider the influence of selective bias in choosing a hospital by residents in the same small areas. A major defect of this approach, however, is in the promotion of the status quo and paying no regard to other than increases in population numbers. Other demographic and socio-economic characteristics are not considered to have any impact on utilization. Availability and accessibility were assumed to remain constant and would therefore not have any appreciable change in the amount of utilization forecast. Also, technological change in medical delivery was not evaluated. All hospitals selected were also assumed to deliver the same quality of care and therefore no differentiation between the hospitals was made. This is probably a misconception resulting from a belief that hospital care is the optimum in medical care. For this reason no other form of medical care, i.e. preventive, rehabilitative medical care, was seen to produce any change in the amount of utilization that is existing at the present moment.

Schneider in the United States, however, has described a conceptual model for evaluating the locational efficiency of health resources.(1) Although his study was mainly centred on urban hospitals, its application on a regional scale is more meaningful. His study was mainly developed as a reaction to the inadequacy of the distribution of medical resources from an economic point of view. He assumed that it is reasonable to expect a further decline in the locational efficiency of existing urban hospitals as the spacial extent of the metropolitan area is enlarged to accommodate population growth. A decline in efficiency can be defined as equivalent to a rise in monetary and time costs of travel by various groups of hospital users. He proposed measure for this locational efficiency which he called the "locational imbalance vector" (L.I.V.) is derived from the classical location theory following his work with Isard and Coughlin(2) on input-output analysis. According to Schneider, the location of a hospital may be evaluated in terms of its need to be close to its sources of input and to the market it serves. The primary inputs required to produce an output of treated patients are space, equipments, personnel and material, i.e. hospital, supplies and staff. The space and equipments were assumed to be already

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(1) Schneider, J.B. (1967). Measuring the Locational Efficiency of the Urban Hospital. Op. Cit.

(2) Isard, W. and Coughlin, R.E. and Schneider, J.B. (1964). The Activity Structure and Transport Requirement of a Major University Hospital, Discussion Paper, Series No.4. Philadelphia: Regional Science Research Institute.

located and their cost is already considered in the site selection. The cost of transporting personnel, material as well as the input resources, i.e. untreated patients, he considered to be not normally allowed for as part of the operating costs of the hospital. Such important costs have normally been considered as external or societal costs and are not therefore assessed in the economical evaluation of the hospital. According to his initial assumption, the economic situation of the hospital is going to deteriorate as a result of population shifts due to the expanding metropolis. However, Schneider turned his focus from the hospital economy as an objective to the community. The community objective in this case would necessitate that the planner should strive to counterbalance these forces which would ultimately lead to the elimination of the hospital from the market if the economic deterioration continues. He considered that in order to do this two sets of weights are relevant, i.e. the community's relative evaluation of time and the relative frequency of hospital trips. The most desirable location for the hospital from the collective point of view of all the users would be when the hospital is located at the point of minimum aggregate travel (P.M.A.T.). The distance in direction from the hospital's existing position to the point of minimum aggregate travel, Schneider represented by a vector which he interpreted as the measure of the locational efficiency and which he labelled as the locational imbalance vector (L.I.V.). A long L.I.V. will show that the hospital is less efficient than a short L.I.V.

Although Schneider was more concerned about the efficiency of the hospital, he was not concerned about what a certain L.I.V. means in relation to the amount of care that the community gets in relation to its need. In his model the needs of the people for medical care were assumed to be equally divided in the community and accordingly by placing the hospital at the gravitational centre of the community, minimum injusticies will be incurred. Although the concept of relative frequency of visits can be important in assessing the relative community medical care needs, the concept of relative evaluation of time is rather meaningless in terms of illness.

4.4.2 The Population Centred Approach

This approach is based on the current patterns of hospital use by a definite population. The population to be surveyed is taken as the residents of a particular geographic area. The pattern of bed utilization for this specified population is determined by analysis of bed use data from hospitals both inside and adjacent to the defined area. It should be noted that this method is in effect a measure of current use of hospital beds rather than demand for beds. This approach is more useful in planning hospital beds than in total planning of health resources for people. It has the advantage of fostering the idea of community care with hospitals as an essential but not the only component.

Forsyth and Logan have used both facility centred and population centred approaches in Barrow-in-Furness in the north of England.[1] A factor facilitating the use of both these approaches was Barrow's peninsular geography and the consequent clear regional boundary.

Popov's study previously outlined employs a similar approach which links utilization estimates to morbidity data obtained from a survey in a defined area.[2] Other studies like those of Engel[3] and Gödlund[4] in Sweden used a modification of the approach in their plans for the regionalization of health services in Sweden.

In Sweden, it was decided to centralize the super specialities, such as neurosurgery, in one teaching hospital which would be the principal medical centre for a region. Using hospital utilization experiences of different surveyed populations, as well as expert opinions, the Swedish planners defined the desired ratio of super speciality beds to population. By defining the minimal desirable size of the super speciality units, they were able to define the optimum size of a region.

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(1) Forsyth, G. and Logan, R.F.L. (1960). The Demand for Medical Care, A Study of the Case-Load in the Barrow and Furness Group of Hospitals. London: Oxford University Press for The Nuffield Provincial Hospital Trust.

(2) Popov, G.A. (1966). Questions of Theory and Methodology of Health Service Planning, Op. Cit.

(3) Engel, A. (1962), "The Swedish Regionalized Hospital System. In Hospital Services of the Western European Conference. London: King Edward Hospital Fund.

(4) Gödlund, S. (1961). Population, Regional Hospitals, Transport Facilities and Regions, Op. Cit.

For example, if the experts defined the minimal size of a plastic surgery unit as 60 patients and the bed needs for plastic surgery patients in Sweden were found to be 5.5 beds per 100,000 population, then the minimal size of a region that could generate enough patients to support a plastic surgery units would be:-

$$(60 \times 100{,}000) \div 5.5 = 1 \text{ million persons (approximately)}$$

With respect to the geographic distribution of the regional centres and their regional size, the planners gave primary importance to the accessibility of the regional hospital centre for the population living in the region.

The constraints chosen as the basis for selection of the centres were travel time and cost. No person within a region should have to travel more than four hours in making the round trip by public transport or a private car. Isochrone maps showing the travel time or isodapane maps showing the travel costs were drawn from the possible centres and the locations chosen were those that minimized the aggregate travel time and cost.

The Swedish approach demonstrates a universal distribution. The demand for medical service was assumed to be universally distributed and accordingly needs were also similarly distributed all through the population. The fact that the standard of living and level of awareness about health and need for cure in Sweden are high for almost all the population alike, helps to close the gap between the needs of the different population groups, and as such the average picture will approximate to reality. The limitations of travel time to a maximum of four hours round trip was seen as a relief of hardships involved in getting to the medical facility, rather than a constraint which is likely to reduce demand when need is felt. In other words, the implied assumption in this case is that people will make the demand when need is felt irrespective of how far the facility is provided. Such an assumption is hard to prove even in an affluent community. In a developing country, this assumption is certainly invalid.

4.5.0 METHODS BASED ON SYSTEM STRUCTURE

This approach to planning the distribution of facilities is based on knowledge of the internal relationships among the different parts of the medical system. The required knowledge is not only of the system's static aspect, but also of its dynamic aspect. The approach requires an understanding of the referral and transferral system which provides the dynamic relationship among the parts. By considering the dynamic aspects and knowing the population defined according to the desired demographic or epidemiologic interest, or both, it is possible to speak of the probability that a person will be in a particular flow from one part of the system to another.

Navarro and Parker described a planning model based on these concepts.(1) The model, based on a Markovian Process, is used to predict resource requirements, to calculate change in these requirements in simulated situations, and to estimate the best alternative for reaching a desired goal in the presence of a defined constraint. In prediction and simulation, the required resources are obtained from the multiplication of the vector representing the utilization of the health services by the transitional probability matrices representing the dynamic system. In the last application or goal seeking, the problem solved is to minimize the charge or cost in reaching the de-

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(1) Navarro, V. and Parker, R. (1968). A Mathematical Model for Health Planning: Prediction, Simulation and Góal Seeking, Paper presented to the Fifth Scientific Meeting of the International Epidemiological Association, Primosten, Yugoslavia.

sired goal. This minimization of charge or cost is the objective function of a mathematical quadratic programme.

Other studies employed mathematical models of various types to depict the system structure and suggest the planning solution that is likely to reduce the cost of the medical service to the minimum. Amongst these were a study by Bartholomew[(1)] and another by Williams[(2)] and associates. Williams and associates have used a Monte Carlo technique to simulate present and future situations in a hospital out-patient clinic in order to improve efficiency.

The advantage of mathematical models in planning is that they allow greater clarity and precision than the purely intuitive methods. However, the validity of all these mathematical models depends on the validity of their assumptions. The greatest difficulty inherent in most models used in health planning is in their goal setting. While almost all of the previously mentioned models defined as their planning objective the minimization of cost either to the individual or the community, none of them attempted to set the objective as that of maximizing the health condition of the people which is the ultimate goal in any health service programme. The underlying assumption in most of these studies is that minimizing the cost leads automatically to maximization of

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(1) Bartholomew, D.T. (1967). Stochastic Models for Social Processes. London: John Wiley and Sons Inc.

(2) Williams, T.W. et.al. (1967), "Simulation Modelling of a Teaching Hospital Out-Patient Clinic". Hospital, 41:71.

the community health. In a limited community definition this may be true, but on a wider community definition as would be the case in a large region or a country, this assumption could be very far from true.

4.6.0 METHODS BASED ON SYSTEM PERFORMANCE

This approach depends on analysis of the performance of the medical care system. The required resources are determined by the amount and type of need in order to achieve a definite output measured in terms of performance such as reduction or control of death, disease, disability or discomfort. The absence of objective measurements of the relationship between systems and performance explains why many of the studies previously mentioned rely on such subjective measurements as "experts' opinions" or "experience of other areas" etc. Actually subjective measurements may be regarded as a variant of the system performance methods. The increasing use of panels of experts to develop quantitative estimates of a phenomenon in social services has been studied by the Rand Corporation.(1) An example of the panel of expert approach is given in a study by Ahumada and associates.(2) In this study the main goal is to decrease mortality by disease categories subject to the constraint of cost. Although it would be possible to take morbidity into account also, only mortality was considered owing to the lack of data on morbidity. The first step is to establish a priority rating for each cause of death by disease cate-

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(1) Brown, B. and Helmer, O. (1964). Improving the Reliability of Estimates from a Consensus of Experts. Santa Monica, Calif.: Rand Corporation.

(2) Ahumada, J. et.al. (1963), "Health Planning: Problems of Concept and Method". Pan American Health Organization, Publication No.111. Washington, D.C.

gory based on incidence of death, i.e. the proportion of death due to each disease category to the total deaths. The relative importance of the disease category is measured by an arbitrary score based on age at death and the degree to which deaths caused by this disease could be prevented. This preventability is defined either by experts' opinion or epidemiological studies. For non-reducible morbidity and the related non-reducible mortality two alternatives are defined:-

1. In the so-called "minimum alternative", the future resources required are calculated by extrapolation of current demand determined by the non-reducible disease;
2. And in the so-called "maximum alternative", the future resources required are defined by expert opinion of what resources should be provided to care for present and prospective demand regardless of cost.

For the reducible morbidity and hence mortality, the required resources needed are divided into preventive and curative resources. The number of preventive resources required is defined by expert opinion of standard prevention needed according to the minimum alternative to keep morbidity and hence mortality at current ratio; or according to the maximum alternative to reduce morbidity and mortality as much as possible regardless of cost. The number of curative resources required, on the other hand, is based on the ratio of utilization to mortality, i.e. a correlation between the mortality ratio for each reducible disease and the hospital and consultation ratio for the same disease.

A similar approach was used by the U.S. Public Health Service, Indian Division.(1) In this study the objective was defined as the quantifiable reduction of morbidity and mortality. Health problem priorities are based on a health problem index which takes into account morbidity, mortality and utilization for each category of disease. The resources required are estimated by the plan of action chosen with the choice based on a cost benefit analysis of the different alternatives. It should be noted that cost benefit analysis in this case can only be useful in selecting the best alternative from a cost point of view rather than from health maximization considerations.

The limitations of this approach, however, lie in the fact that little is known about the effectiveness of different health service systems. Most analytic studies have been concerned with productivity expressed in terms of efficiency but not with effectiveness. The paucity of methods on effectiveness is due to present limitations in knowledge of how to measure the different variables in the output as well as in the input and their relationship. Except in few instances, relationships between the system and its performance are not known, even less known about methods for quantifying them. For example, there is no evidence that providing x units of prenatal care will

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(1) U.S. Public Health Service (1966). Programme Packaging. Washington, D.C.: Division of Indian Health, Bureau of Medical Service.

save y children's lives. Although some attempts with this approach were made to assess requirements in preventive as well as curative care, no attempt was made to link the two requirements together to find the factors that influence both in order to enable assessment of their future impact to be made.

4.7.0 SUMMARY AND IMPLICATIONS

In this chapter, six different approaches to planning for the distribution of curative facilities have been discussed. The shortcomings of each approach have been pointed out. The first approach relies on the use of morbidity data as the basis for planning. In this approach, two sequential steps are followed: a survey of people's need, either as perceived by the people concerned or as assessed by experts; and a translation of such need into resources according to expert opinion.

The second approach is principally similar to the first, but relies on the use of mortality data which is more readily available than morbidity data for the definition of need. In this approach, it is assumed that there is a constant ratio that links utilization to mortality rate. In this approach as in the previous one, the fact that need exists does not necesarily indicate that demand will be created. The danger with planning simply for need without exploring how demand is created lies in the possibility that valuable resources may be wasted without necessarily satisfying all needs.

The third approach ignores need altogether and relies mainly on demand as a more "practical" basis for planning. It assumes that current utilization experience is adequate for planning future curative provisions. Within this approach, three types of methods have been identified; the present demand method, the comparative method and the demand analysis method. The present demand method assumes a constant ratio between present use and population which can be used for future planning. The comparative method tries to overcome a defect of the previous method by ensuring that such a ratio should be obtained from an area where the curative resources are considered to be adequate before it could be used elsewhere for planning purposes. The demand analysis method applies market analysis techniques to consumer use of curative resources. Of these three types this forms the latest and more sophisticated approach to planning for the distribution of curative facilities. However, it fosters the idea that curative facilities can be considered and accordingly analyzed as any commercial good rather than as a social service with an objective of a different nature. It also fails to link demand for curative facilities adequately with its causal factors. It also fails to differentiate between the hierarchical levels of curative medicine, and their impact on each other.

The fourth approach is based on distribution. It tries to explore the geographic and functional relationship between resources and the people served. Within this approach, two types of methods have been identified, the facility centred and the population centred methods. The facility centred method tries to define the catchment area for a hospital or a group of hospitals in order to relate the population of defined areas of residence to available facilities as a basis for future planning and distribution of facilities. The population centred method, on the other hand, analyzes the pattern of hospital use by a definite population of a geographical area as the basis for future planning and distribution. A combined approach using these two methods has also been discussed. It has been pointed out that such methods individually or combined promote the status quo and magnify the scale of its defects in future planning and distribution. In particular, the population centred method is nothing more than a measure of current use of hospital beds rather than a measure of prospective demand or need for curative facilities.

The fifth approach is based on system structure. It tries to depict the static and the dynamic structure of the curative system by the use of mathematical models, and, later to use such models to reach a desired goal of health care provisions in the presence of cost constraints. The emphasis in most of such models is on cost minimization rather than maximazition of the state of health which is the basic objective in health planning. This approach could be more useful in dealing with efficiency of medical care delivery than in total planning for the optimum and equitable distribution of curative facilities.

The sixth approach is based on system performance. It relies on the analysis of the performance of the medical care system with the objective of maximizing the medical care output, i.e. treated patients. This hardly touches on need or its satisfaction. Like the previous approach, this last one is more useful in dealing with efficiency problems rather than with the effectiveness of the medical care system. Very little is known about effectiveness of the system, however, which is why many studies rely heavily on a consensus of panels of expert opinion.

In sum, none of the approaches discussed satisfactorily fulfils the conditions necessary for planning an optimal and at the same time equitable distribution of curative facilities in a region. However, each of the six approaches, despite their individual shortcomings, deals with limited but important aspects in the attainment of such an optimal and equitable distribution. In the case of a developing country particularly, a closer study and a more comprehensive approach to planning is called for than has been provided by any of the foregoing approaches. In the following chapters such an attempt will be made. In the next chapter, a region of the Sudan will be described in an effort to set the scene for a close study of the regional distribution of curative facilities in that developing country.

PLANNING FOR AN OPTIMAL AND EQUITABLE REGIONAL DISTRIBUTION OF CURATIVE HEALTH FACILITIES, WITH SPECIAL REFERENCE TO THE BLUE NILE PROVINCE OF THE SUDAN.

CHAPTER 5

THE REGION UNDER STUDY

CONTENTS Page

5.0.0 THE REGION UNDER STUDY

The Blue Nile Region

In order to study the regional distribution of curative facilities more closely, a region has been selected for this study - the Blue Nile Region. The use of the term "region" in developing countries is only an approximation to its use in developed countries. In the planning field, the use of this term often implies a certain degree of homogeneity and cohesion between the parts both in economic and social terms. While this is the case in planning regions of most of the latter countries, it is rarely so in planning regions of the former countries. These, unless very small, often reflect more heterogeneity and diversity than homogeneity. The reasons for this are due to many factors amongst which are the dominance of subsistence economy, lack of effective transport facilities, social isolation of the communities dictated by strong tribal and religious feelings, and the non-comprehensive nature of their governments' projected social and economic developments. Policies for social and economic developments in most developing countries have not been effective enough to alleviate these unfavourable conditions. Accordingly, the term "region" in this and subsequent chapters relates only to some vague notion of regionalism as it is known in most developed countries.

This chapter gives a brief description of the major features of the area under study. This description will be presented under the following three main headings:-

1. General Characteristics of the Region;
2. Health State in the Region; and
3. Health Care Resources in the Region.

5.1.0 GENERAL CHARACTERISTICS OF THE REGION

The region under study comprises the Blue Nile Province of the Sudan within its established administrative boundaries. (See Map 5 - 1)[1] This region has been selected for this study largely for convenience and as an academic exercise to demonstrate the complexity of the problem studied, rather than to draw general conclusions regarding the distribution of medical care facilities in the whole country. In this respect the study can be considered as a pioneering work for similar studies to be conducted in other regions of this country or other developing countries. This region is not an average region in the Sudan. It is, in most cases, one of the luckiest regions in the country in terms of economic and social developments. The scale of diversity inherent in other regions of the country can still be visualized through the study of this region. Such variations shape people's lifestyles and, accordingly, influence their health condition and illness behaviour.

5.1.1 Geography and Administrative Features

The Blue Nile Province is one of the nine provinces

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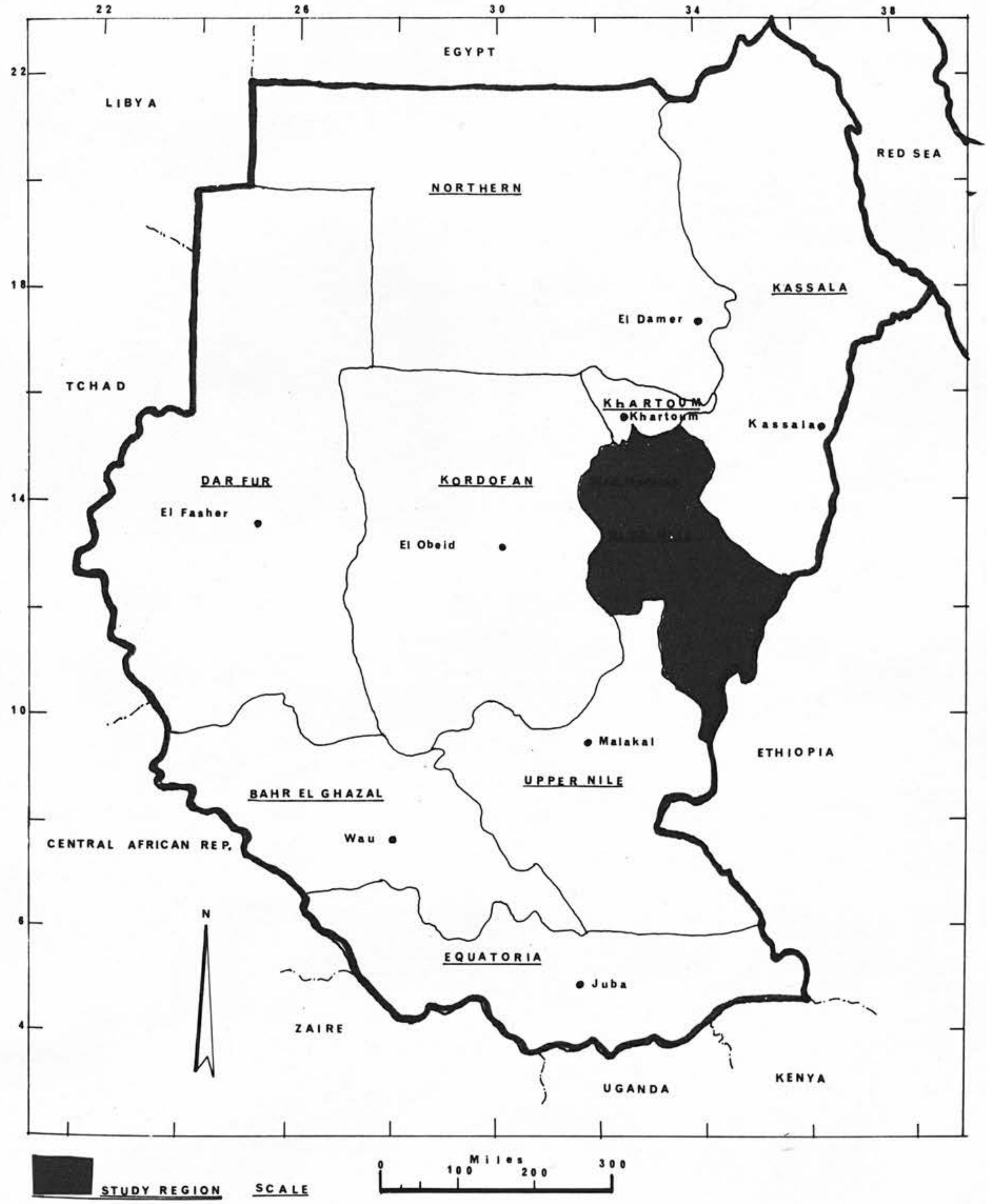
(1) It should be noted that recently the Province has been divided into three provinces, largely conforming with the boundaries defined for the sub-regions in this study.

MAP 5 - 1

PROVINCIAL BOUNDARIES - SUDAN

MAP 5-1

PROVINCIAL BOUNDARIES - SUDAN



into which the Sudan is administratively divided. It is centrally located in the one million square miles which make the country. The region lies mainly within the fertile plain between the Blue and the White Niles south of the country's capital, Khartoum. The area is extensive and is situated roughly between latitudes 15.5^{o} and 11^{o} north of the equator, and longitudes 35^{o} and 31.5^{o} east of Greenwich. It covers an area of about 156,200 square kilometres of very flat land bounded by semi-desert climatic conditions in the very north and semi-equatorial conditions in the very south. Average monthly climatic conditions are given in Table 5 - 1 which only reflect average climatic features. Such climatic conditions would obviously have great bearing both on the patterns of diseases and on the accessibility situation to the dispersed curative facilities.

Although the region is roughly about 1/17 of the total area of the whole country, its population accounts for over 1/5 of the country's population; i.e. 3,156,000 persons.[1] This fact makes the region one of the most densely populated areas of the country; i.e. 22 persons/square kilometre in 1970/71.[2] It should be noted that six of the nine provinces (amongst them Khartoum and the three southern provinces) con-

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(1) This figure is an estimate for 1970. Total population of the Sudan in the same year is estimated at 15,782,000 persons.

(2) Average density for the whole country in 1970/71 is around 6 persons/square kilometre. (See Map 5 - 2).

TABLE 5 - 1

METEREOLOGICAL DATA FROM THE RESEARCH DIVISION STATION, WAD MEDANI (AVERAGES OF 23 YEARS 1949 - 1972).

Month	Rainfall m.m.	Temperature (cent.) Max.	Min.	Relative Humidity %
January	-	33.9	14.2	36
February	-	35.4	15.1	26
March	-	38.4	17.7	20
April	3.3	41.1	20.9	17
May	11.0	41.0	23.7	32
June	33.3	39.7	24.4	46
July	132.2	35.6	22.5	68
August	146.1	33.5	22.0	76
September	55.5	35.8	22.0	68
October	13.3	38.5	21.9	48
November	1.1	36.8	18.2	33
December	-	34.5	15.2	37
Total (Rainfall)	395.8			

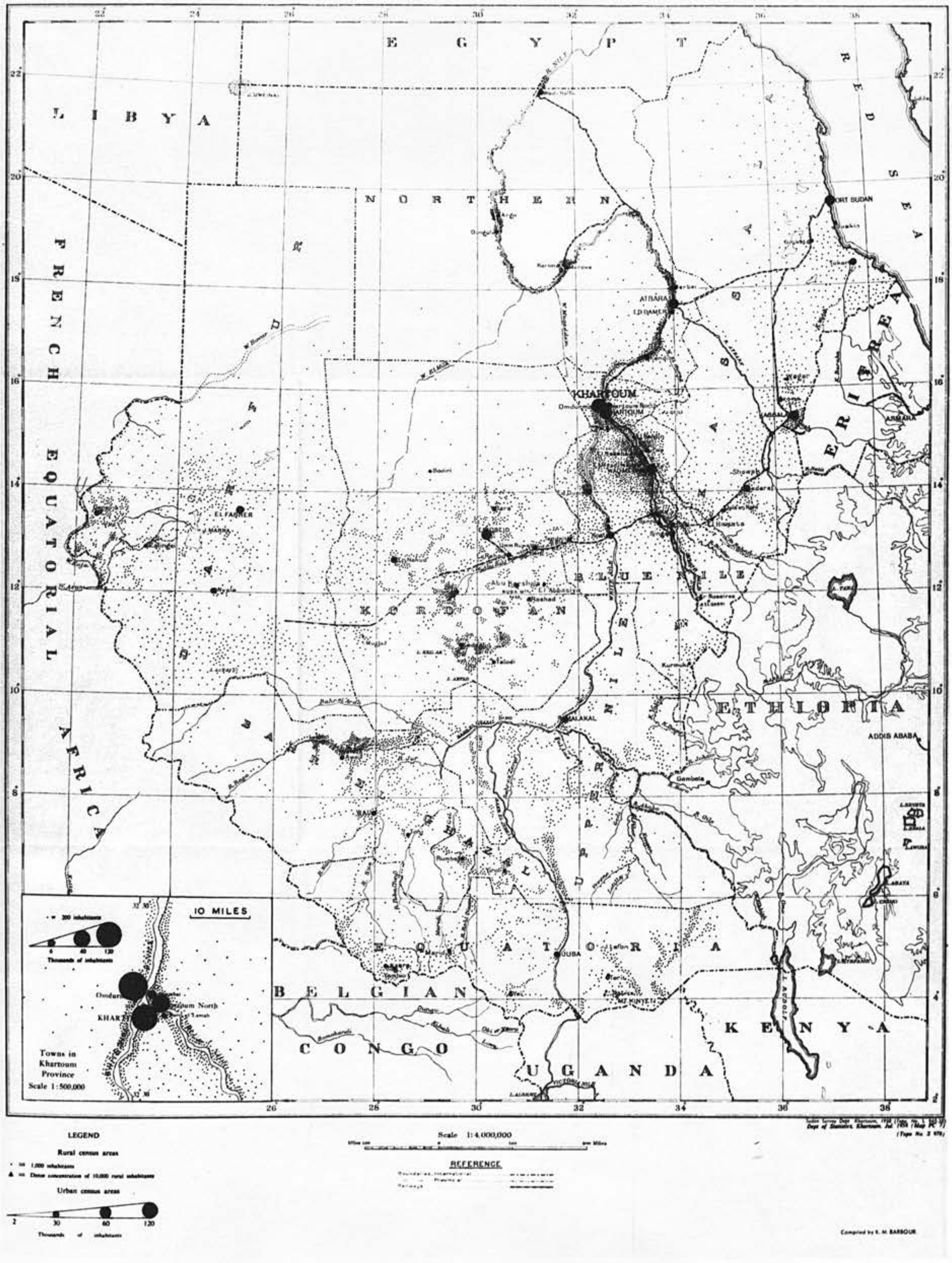
MAP 5 - 2

DISTRIBUTION OF POPULATION - SUDAN

MAP 5-2

FIRST POPULATION CENSUS OF SUDAN 1955/56

DISTRIBUTION OF POPULATION



tain in each case less than 1/10 of the population. Table 5 - 2 gives the population figures in two years (1955/56 and 1970/71) in the nine provinces. These population numbers together with the high population density which characterizes the Blue Nile Province have an important bearing on the distribution and the efficiency of location of curative as well as other medical care resources. Although the high population figure may suggest the need for more curative resources, the high population density may suggest the possibility of more efficiency in the delivery of medical care facilities especially in the central institutions and, accordingly, greater economy in curative resources.

Although to a large extent the administration of the country is centralized in Khartoum, a certain level of regional autonomy is given to the provinces. The Blue Nile Province is effectively administered from its regional capital, Wad Medani, about 1/4 of the way from Khartoum southwards along the Blue Nile river to the provincial boundary. The executive powers in all matters concerning development are entrusted to the provincial governor and his assistants in different fields of social and economic activities including medical. The sheer distance and the lack of efficient transport facilities coupled with muddy unusable roads, especially during the rainy season, are obviously limiting factors in the implementation of more effective planning in the province not only in the field of health but also in all aspects of social and economic development. However, a limited degree of administrative power

TABLE 5 - 2

POPULATION NUMBERS IN THOUSANDS IN THE YEARS 1955/56 AND 1970/71 AND AREA IN SQUARE KILOMETRES IN THE NINE PROVINCES OF THE SUDAN

SOURCES: (1) Population Census 1955/56,

(2) Department of Statistics Estimate (1970/71), and

(3) Sudan Almanac (all years).

Province	Pop. No. in (1000's) 1955/56	Pop. No. in (1000's) 1970/71	Area Square Kilometres
Northern Sector			
1. Blue Nile	1,636.3	3,156.0	156,200
2. Dar Fur	1,102.4	1,964.0	496,369
3. Kassala	766.4	1,129.0	340,655
4. Khartoum	421.5	877.0	20,971
5. Kordofan	1,428.0	2,811.0	380,546
6. Northern	696.6	1,333.0	477.074
Southern Sector			
7. Bahr El Ghazal	749.4	1,427.0	213,751
8. Equatoria	724.0	1,303.0	198,121
9. Upper Nile	694.9	1,282.0	236,180
Sudan	8,219.6	15,282.0	2,519,867

is entrusted to the local administrative machinery, mostly in minor matters. Regarding the local administration, the Blue Nile Province has 15 local rural councils and 4 municipal councils for the four main towns. Map 5 - 3 shows the location and boundaries of these local rural units. Table 5 - 3 gives the population, area size, agricultural land under cultivation and annual council expenditures in various local activities in each local unit.(1) The table shows that local administrative units in the North Blue Nile sub-region are more densely populated and have higher measures of local social welfare than any of those in South Blue Nile or White Nile sub-regions. This is in addition to the generous funds which the Gezira Board spends annually on social welfare in the irrigated area of North Blue Nile, an additional source of revenue which puts the North Blue Nile sub-region in a more advantageous situation than the other sub-regions.(2)

5.1.2 Demographic Structure

Both in sex composition and in age structure the Blue

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(1) Since these local units rely mainly on agricultural farming, the size of agricultural land gives an indication of the variation in the average standard of living despite the differences in type of land, irrigation system and productivity. The annual expenditure gives an indication of the variation in the activities of these local units and their potential in supplying certain measures of social welfare.

(2) The Gezira Board is a semi-governmental body entrusted with the administration and technical supervision of the Gezira Agricultural Scheme in North Blue Nile. Its expenditure in social welfare is over 2.5 million pounds annually.

MAP 5 - 3

BLUE NILE PROVINCE - LOCAL COUNCIL AREAS

MAP 5-3

BLUE NILE PROVINCE-LOCAL COUNCIL AREAS

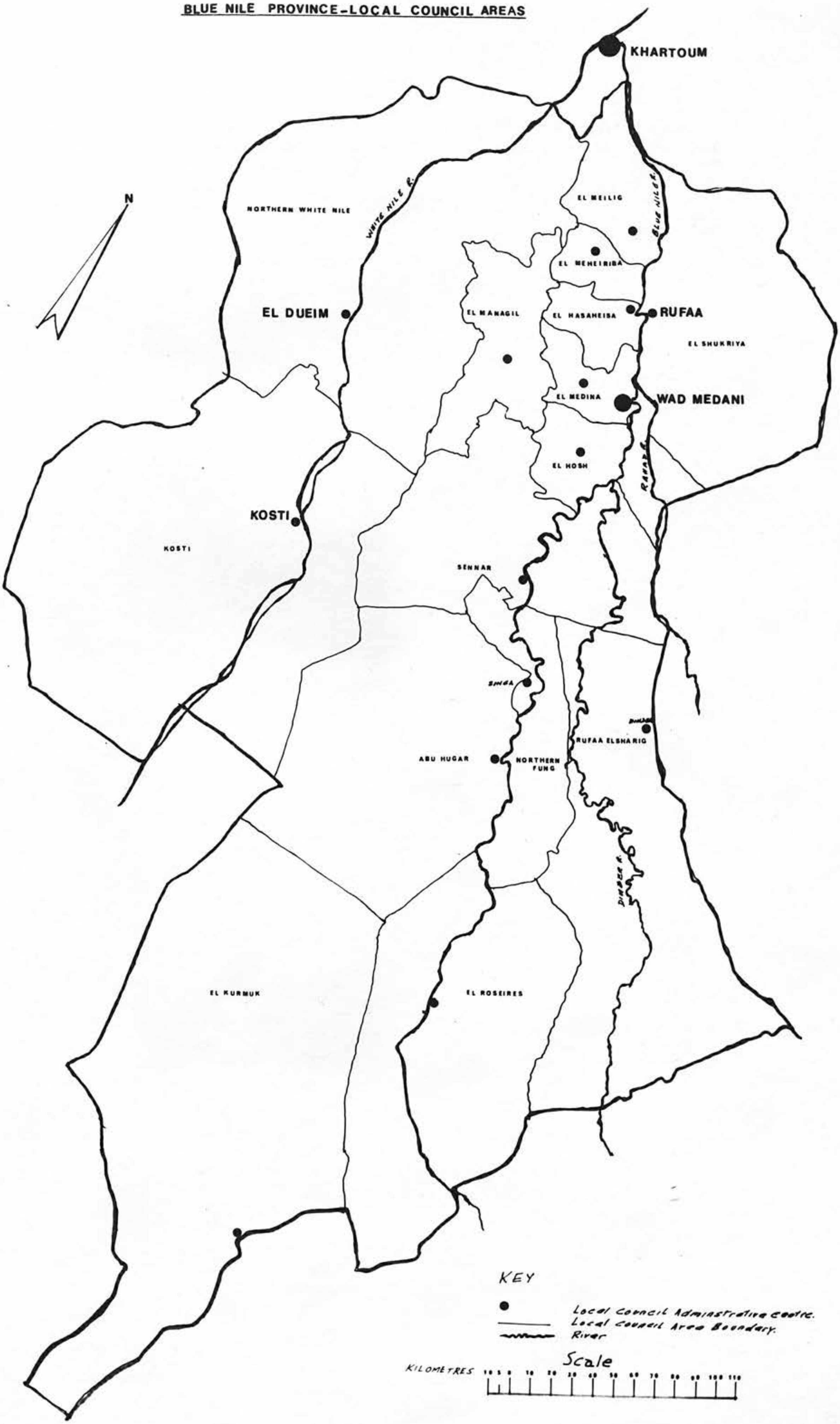

TABLE 5 - 3

POPULATION NUMBERS, AREAS, AGRICULTURAL LAND UNDER CULTIVATION AND YEARLY GOVERNMENT EXPENDITURES IN THE LOCAL COUNCILS OF THE BLUE NILE PROVINCE.

SOURCE: Five Year Economic and Social Development Plan 1970/71 - 1974/75: Ministry of Economic Planning, Khartoum.

(Figures are given for the year 1968/69.)

Local Council (Rural council or Municipality)	Population in thousands	Area in thousand Square Kilometres	Agricultural Land under utilization in thousands of square kilometres	Yearly expenditures in thousands of Sudanese Pounds
North Blue Nile	1,099	22.3	6.8	1,479
Meilig R.C.	119	2.1	0.9	151
Shukriya R.C.	226	9.7	1.1	147
Rufaa M.	18	-	-	27
Meheiriba R.C.	78	1.2	0.7	100
Hasaheisa R.C.	121	1.4	0.9	201
El Medina R.C.	139	1.4	0.7	187
Wad Medani M.	65	-	-	300
El Hosh R.C.	171	2.7	0.9	190
Managil R.C.	162	3.8	1.6	176

TABLE 5 - 3

..CONTINUED

Local Council (Rural Council or Municipality)	Population in thousands	Area in thousand Square Kilo- metres	Agricultural Land under utilization in thousands of square kilometres	Yearly expenditu- res in thousands of Sudanese Pounds
South Blue Nile	746	88.4	5.5	841
Sennar R.C.	230	9.4	1.5	319
Northern Fung R.C.	146	4.0	1.4	177
Abu Hugar R.C.	99	23.0	1.0	126
Rufaa El Sharig R.C.	74	15.0	1.1	83
El Roseires R.C.	144	12.0	0.4	112
Kurmuk R.C.	53	25.0	0.1	24
White Nile Area	903	45.6	5.7	892
Kosti R.C.	302	24.0	3.2	435
Kosti M.	45	-	-	147
North White Nile R.C.	534	21.6	2.5	249
Dueim M.	22	-	-	61
Total (Province)	2,748	156.2	18.0	3,212

- Signifies that the area of the municipality is already considered as part of the Rural Council above it.

Nile Province has some unique characteristics when compared with the rest of the country. Statistical evidence show that males generally outnumber females in the Sudan, a characteristic which many countries of the world share, especially in the younger age groups. However, this tendency varies from one province to the other in the Sudan. But on the average, the male sex in the Sudan outnumbers the female sex by one in every 100 persons. Table 5 - 4 shows the masculinity ratio in various provinces of the country. The masculinity ratio, as the phrase suggests, gives the number of males per 100 females. The Blue Nile Province is shown to have a much higher masculinity ratio than the average. Despite its dominant rural character, its masculinity ratio is only exceeded by the two most highly urbanized provinces, i.e. Khartoum and Kassala. This fact may have special implications for the Blue Nile Province from the rest of the country with regard to health as well as to the use of medical care facilities. Within the Blue Nile Province itself variations in masculinity ratios are not very great. Table 5 - 5 shows only very slight differences between the three main sub-regions but generally the North Blue Nile sub-region seems to have a more balanced sex composition than the other two sub-regions.

As far as age structure is concerned, the Sudan generally seems to be amongst the youngest countries in the world. It has a high proportion of children. Table 5 - 6 shows that, on the average, the Sudan has 43% of its population under puberty. Though this fact will certainly have great implications

TABLE 5 - 4

SEX STRUCTURE IN THE PROVINCES OF THE SUDAN - MASCULINITY RATIOS.

SOURCES: Population Census 1955/56, Department of Statistics, Khartoum.

Province	Masculinity Ratio
Nothern Sector	
1. Blue Nile	106
2. Dar Fur	91
3. Kassala	115
4. Khartoum	118
5. Kordofan	102
6. Northern	94
Southern Sector	
7. Bahr El Ghazal	104
8. Equatoria	96
9. Upper Nile	105
Sudan	102

TABLE 5 - 5

SEX STRUCTURE IN SUBREGIONS OF THE BLUE NILE PROVINCE - MASCULINITY RATIOS.

Source: Population Census 1955/56, Department of Statistics, Khartoum.

Subregion	Masculinity Ratio
North Blue Nile	105
South Blue Nile	106.7
White Nile	106.5
Province	106

TABLE 5 - 6

AGE STRUCTURE IN PROVINCES OF THE SUDAN - IN PERCENTAGES OF TOTAL POPULATION IN EACH PROVINCE.

SOURCE: Population Census 1955/56, Department of Statistics, Khartoum.

Province	Under 1 year	1 to under 5 years	5 to under puberty (1 - 17)	Over puberty (18 upwards)
Northern Sector				
1. Blue Nile	4.4	16.6	24.8	54.2
2. Dar Fur	3.9	13.2	24.5	58.5
3. Kassala	4.0	14.5	22.6	58.8
4. Khartoum	3.9	12.6	25.8	57.7
5. Kordofan	4.7	14.3	23.1	57.9
6. Northern	4.0	16.2	27.4	52.4
Southern Sector				
7. Bahr El Ghazal	7.7	16.7	18.5	57.1
8. Equatoria	4.9	15.0	20.2	60.0
9. Upper Nile	6.1	15.6	19.9	58.2
Sudan	4.8	15.1	23.1	57.0

on the economy of the country, it may equally well be reflected in the pattern of diseases and in the use of medical care resources. The table also shows that the Blue Nile Province is again notable amongst the leading provinces - in respect of its high percentage of children, about 46%. It is only exceeded by the Northern Province which has about 48%. However, variations between the different parts of the province are great and again the North Blue Nile sub-region seems to have the highest percentage of children, 47%, among the three sub-regions. (See Table 5 - 7.)

5.1.3 Social Background

The heterogeneous population of the Blue Nile has as its foundation the riverain tribes of the area, themselves diverse in their origins and histories, but all mainly of Arab stock. The census figures(1) show the Blue Nile to have the highest percentage of Arab population in the country. While the census shows the Arab population of the whole country to be only 39%, 74% of the population of the Blue Nile Province are Arabs. There has not been much radical change in the area within the last twenty years as far as this particular aspect is concerned, and it is probable that the Blue Nile still retains its predominantly Arab character. Among these Arabs live some minority groups of immigrants from other parts of the country, particularly the west, and from other countries like

(1) The 1955/56 census was the only available census of the Sudan until recently. A more recent census was conducted in 1972, but its results have not yet been published. So, most of the figures related to the 1955/56 are subject to revision.

TABLE 5 - 7

VARIATIONS IN AGE STRUCTURE WITHIN THE BLUE NILE PROVINCE (IN PERCENTAGES).

SOURCE: Population Census 1955/56, Department of Statistics, Khartoum.

Local Council (Rural Council or Municipality)	Under 1 year	1 to under 5 years	5 to under puberty	Over puberty
North Blue Nile	4.7	17.4	24.9	53.0
Meilig R.C.	5.0	18.0	25.2	51.6
Shukriya R.C.	3.4	18.1	24.6	53.8
Rufaa M.	-	-	-	-
Meheiriba R.C.	6.0	19.2	24.7	50.0
Hasaheisa R.C.	4.9	18.2	24.6	52.4
El Medina R.C.	4.7	19.6	23.4	52.3
Wad Medani M.	3.5	13.1	23.9	59.5
El Hosh R.C.	5.0	18.1	25.2	51.7
Managil R.C.	4.9	15.2	27.2	52.8
South Blue Nile	4.5	15.7	24.9	55.1
Sennar R.C.	4.7	16.3	25.7	53.4
Northern Fung R.C.	4.3	15.5	24.3	55.9
Abu Hugar R.C.	3.9	15.8	25.7	54.6
Rufaa El Sharig	4.3	15.5	24.3	55.9
El Roseires R.C.	4.0	14.7	23.2	58.2
Kurmuk R.C.	4.0	14.7	23.2	58.2
White Nile Area	4.2	16.0	24.2	54.8
Kosti R.C.	4.8	14.3	22.9	58.1
Kosti M.	-	-	-	-
North White Nile R.C.	3.8	17.2	25.1	52.6
Dueim M.	-	-	-	-
Province	4.4	16.6	24.8	54.2

Chad and Nigeria. These immigrants, though important in the economic life of the area, are generally not integrated socially with the rest of the people. They generally live apart in communities of their own. However, many of them are pilgrims on their way to or from Mecca, stopping off, it may be for years to earn money for their onward journey. Therefore, it is right to say that the dominant social background of the area is Arabic and mainly Islamic in general pattern, and, especially in the rural area, conservative of old traditions. It is, therefore, characterized by the seclusion of women and the sharp division of the society into two worlds, each absorbed in its own cycle of activities, interests and style of life. The link between the two worlds, of course, is man in his various roles as father, brother, son or husband; but the degree to which the two circuits function independently of one another gives a curious duality to family life and produces unique norms of conduct and social values. This social dichotomy will obviously influence the living patterns of the two sexes and may greatly affect their health and illness behaviour.

5.2.0 HEALTH STATE IN THE REGION

The question naturally arises how healthy is the population of the Blue Nile Province. This is, of course, very difficult to measure but some indication is provided by considering some vital statistics as mortality rates, morbidity rates and hospital admission rates.

5.2.1 Mortality

The crude death rate statistics show that the Sudan is much better off than most African countries. While the average crude death rate for Africa is around 21 per 1,000 population (in 1968), the Sudan's average is only 18.5 per 1,000 in the same year. Although this figure is low compared to Africa, it is somewhat higher than the average for the whole of the developing world, 17 per 1,000. However, crude death rates variations within the Sudan are great. The figures for the Blue Nile province are much below the average, being 14.7 per 1,000 population. Table 5 - 8 shows that the Blue Nile Province is amongst the healthiest three provinces as measured by crude death rates. It is only excelled by the Northern and Dar Fur Provinces. However, variations within the Blue Nile Province itself in crude death rates are great, as Table 5 - 9 may suggest. The general trend shows that local councils areas in the South Blue Nile sub-region are the healthiest as far as crude death rates are concerned. Though the differences between the North Blue Nile council areas and the White Nile council

TABLE 5 - 8

MORTALITY RATES IN PROVINCES OF THE SUDAN - CRUDE DEATH RATES AND INFANT MORTALITY.

SOURCE: Department of Statistics, Khartoum (1967/68).

Province	Crude Death Rate per 1000 Persons	Infant Mortality Rate per 1000 Live Births
Northern Sector		
1. Blue Nile	14.7	72.2
2. Dar Fur	13.0	75.0
3. Kassala	17.5	82.0
4. Khartoum	14.9	72.4
5. Kordofan	15.5	76.0
6. Northern	12.1	64.7
Southern Sector		
7. Bahr El Ghazal	27.3	111.9
8. Equatoria	27.0	132.9
9. Upper Nile	32.6	143.9
Sudan	18.5	93.6

TABLE 5 - 9

MORTALITY RATES WITHIN THE BLUE NILE PROVINCE.

SOURCE: Department of Statistics, Khartoum (1967/68).

Local Council (Rural Council or Municipality)	Crude Death Rate per 1000 Persons	Infant Mortality Rate per 1000 Live Births
North Blue Nile	14.6	60.8
Meilig R.C.	18.9	58.7
Hasaheisa R.C.	14.6	67.4
Meheiriba R.C.	12.0	64.2
Shukriya R.C.	12.8	74.2
Wad Medani M.	11.8	49.8
El Medina R.C.	19.2	60.2
El Hosh R.C.	16.4	55.7
Managil R.C.	10.9	56.1
South Blue Nile	13.7	76.6
El Roseires R.C.	14.1	81.5
Kurmuk R.C.	14.1	81.5
Sennar R.C.	15.4	66.4
Abu Hugar R.C.	12.8	87.9
Northern Fung R.C.	12.8	69.2
Rufaa El Sharig R.C.	12.8	69.2
White Nile Area	15.1	82.4
Northern White Nile R.C.	17.0	103.1
Kosti R.C.	13.2	61.6
Province	14.7	72.2

areas are not great, North Blue Nile show a healthier tendency in general. It should be pointed out that the crude death rate is a rather poor indicator of health condition. Adjusted death rates for age and sex may prove more efficient in this respect but figures are not available.

Table 5 - 8 also gives mortality rates for the different provinces of the country. Infant mortality rate is often considered to be a better indicator of health condition than crude death rate. In this respect the average figure for the Sudan, 93.6 deaths per 1,000 live births, is lower than both the average for the whole of Africa, 123 deaths per 1,000 live births, and that for the whole of the developing world, 118 deaths per 1,000 live births. Within the Sudan, the variations in infant mortality rates in the northern sector of the country are not great, but this contrasts sharply with that in the southern sector which has wide variations with extremely high figures. However, the table shows that the Blue Nile Province is the second healthiest province in the country with a comparatively low infant mortality rate, with 72.2 deaths per 1,000 live births, excelled only by the Northern Province, with 64.7 deaths per 1,000 live births. However, within the Blue Nile Province itself, there are sharp variations in infant mortality rates but in general local council areas in the North Blue Nile show the healthiest position averaging 60.8, followed by those in the South Blue Nile sub-region, averaging 76.6. White Nile local council areas are the least healthy in terms of this rate, averaging 82.4. The poor health showing in the

White Nile sub-region is accounted for primarily by the Northern White Nile rural council area which has the highest infant mortality rate in the region, 103 deaths per 1,000, whereas the Kosti rural council area has a better rate, 61.6, than the provincial average of 72.2. The healthiest position in the region is shown to be in Wad Medani town, the regional capital, with only 49.8 deaths per 1,000 live births.

5.2.2 Morbidity

Morbidity figures are not useful as indicators of people's health condition in a developing country since they are usually based only on hospital records. In a situation where hospitals are not adequately provided such figures carry some bias in favour of those who are able to report to these curative institutions. However, such morbidity figures can, to a certain extent, show the general pattern of diseases in a region. Table 5 - 10 gives the incidence of five endemic diseases in the Sudan during the years 1960 - 1970 together with the number of deaths from each. The table shows that in general the incidence of these diseases is increasing rather than declining. This apparent trend, however, does not mean that the health condition in the country is worsening; but rather that more people are now reporting these illnesses than they used to do in the past due to more curative facilities being now available.

Table 5 - 11 attempts to give some comparative picture between the provinces in the pattern of these diseases. In

TABLE 5 - 10

INCIDENCE OF FIVE ENDEMIC INFECTIOUS DISEASES AND DEATHS THROUGH THE YEARS 1960 - 1970 IN THE SUDAN.

SOURCES: Annual Statistical Report (1970): Statistics Division, Ministry of Health, Khartoum.

Year	Schistosomiasis		Malaria		Dysentry		T.B. Pulmonary		C.S.M.	
	Cases	D.	Cases	D.	Cases	D.	Cases	D.	Cases	D.
1960	52, 877	42	645,210	336	243,108	181	7,864	337	7,837	460
1961	55,218	29	771,500	419	222,979	234	7,868	319	5,902	431
1962	55,297	24	784,100	375	278,164	209	8,466	403	11,559	137
1963	67,556	34	802,600	304	369,751	223	8,635	316	927	102
1964	83,636	29	782,320	278	375,916	166	7,623	330	5,571	195
1965	90,193	72	638,500	2,234	398,654	163	2,009	305	8,164	133
1966	99,776	44	741,000	325	418,500	180	8,794	285	6,804	140
1967	90,000	49	219,220	280	38,780	118	8,292	261	6,350	102
1968	105,000	120	361,210	815	170,520	200	14,000	950	4,200	102
1969	55,300	410	399,370	2,816	180,500	437	14,650	1,075	5,381	100
1970	161,200	423	832,411	3,024	205,912	149	13,923	1,069	6,912	112

TABLE 5 - 11

INCIDENCE OF FIVE ENDEMIC INFECTIOUS DISEASES (AVERAGE CASES PER YEAR) IN EACH PROVINCE - (AVERAGES FOR THE YEARS 1959 - 1967).

SOURCE: Annual Statistical Report (1970): Statistics Division, Ministry of Health, Khartoum.

Province	Schistosomiasis		Malaria		Dysentry		T.B. Pulmonary		C.S.M.	
	Cases	D.	Cases	D.	Cases	D.	Cases	D.	Cases	D.
Northern Sector										
Blue Nile	26,282	15	105,910	35	59,848	23	544	22	176	25
Dar Fur	10,118	2	74,355	23	19,221	14	381	18	796	33
Kassala	615	2	58,706	20	13,377	16	1,260	42	81	11
Khartoum	7,374	3	25,889	4	85,280	16	2,029	81	1,704	27
Kordofan	11,148	1	131,297	76	29,594	17	795	48	474	40
Northern	4,793	2	13,336	5	40,332	4	606	14	85	7

TABLE 5 - 11

..CONTINUED

Province	Schistosomiasis		Malaria		Dysentry		T.B. Pulmonary		C.S.M.	
	Cases	D.	Cases	D.	Cases	D.	Cases	D.	Cases	D.
Southern Sector										
Bahr El Ghazal	733	2	30,593	48	5,289	14	544	22	176	25
Equatoria	3,817	6	161,365	92	15,681	38	285	13	314	36
Upper Nile	1,144	3	53,497	24	19,503	52	1,332	23	96	7
	66,024	36	654,948	327	288,125	194	7,776	283	3,902	211

schistosomiasis, the Blue Nile Province appears to have by far the highest incidence in the country. This is mainly due to the open-canal irrigation system which is favourable for breeding and the spread of the snails which carry this disease. The Blue Nile Province also has the second highest incidence of dysentry. (It is exceeded only by Khartoum Province.) This is probably due to adverse eating habits with consumption of highly spiced foods in the Blue Nile Province. With regard to malaria the Blue Nile Province also has a high incidence, exceeded only by Equatoria and Kordofan provinces. Both in tuberculosis and meningitis, it has a moderate incidence, although the basis for comparing the incidence of these diseases is not complete. The people in the Blue Nile Province seem to be suffering more from these five diseases, taken together, than most people in the rest of the country. However, the incidence of other infectious diseases like small pox, typhoid, infective hepatitis and influenza, as indicated in Table 5 - 12, shows the people of the Blue Nile as better off than people in most other provinces. Only the incidence of kalazar is higher in the Blue Nile Province than most other provinces.

5.2.3 Hospital Admissions

So far only mortality rates and patterns of some endemic diseases have been considered as indicators of the state of health prevailing in the population of the Blue Nile Province as compared to the population of other regions in the country. While the general statistical evidence show that the

TABLE 5 - 12

INCIDENCE OF FIVE OTHER INFECTIOUS DISEASES AND DEATHS (FOR 1970) BY PROVINCE IN THE SUDAN.

SOURCE: Annual Statistical Report (1970): Statistics Division, Ministry of Health, Khartoum.

Province	Smallpox		Typhoid		Infective Hepatitis		Kalazar		Influenza	
	Cases	D.	Cases	D.	Cases	D.	Cases	D.	Cases	D.
Northern Sector										
Blue Nile	18	1	182	9	979	31	578	8	1	-
Dar Fur	-	-	13	-	1,464	59	45	1	3,548	1
Kassala	83	3	92	1	1,174	23	661	20	4,290	3
Khartoum	246	3	211	-	2,341	-	4	-	9,695	-
Kordofan	32	-	105	1	1,535	19	68	2	9,794	1
Northern	9	-	78	-	2,173	4	2	-	6,185	10

TABLE 5 - 12

...CONTINUED

Province	Smallpox		Typhoid		Infective Hepatitis		Kalazar		Influenza	
	Cases	D.	Cases	D.	Cases	D.	Cases	D.	Cases	D.
Southern Sector										
Bahr El Ghazal	104	4	-	-	468	-	-	-	4	-
Equatoria	119	3	10	-	463	23	100	9	-	-
Upper Nile	32	1	-	-	102	16	365	13	-	-
Sudan (Total)	643	15	691	11	10,699	175	1,823	53	33,517	15

Blue Nile population is healthier than that of most regions in the country, other statistics show that the incidence of most endemic diseases in particular is higher in this region than in most of the other regions. However, if the high incidence of the endemic diseases is standardized, the Blue Nile pattern of endemic diseases will not deviate much from the general pattern in the whole country. There is, however, relatively high hospital admissions rate in the Blue Nile Province as Table 5 - 13 shows. The number of cases admitted to hospitals each year is by far the highest in the country. This again need not be taken as evidence of a poor state of health in the Blue Nile Province in comparison with the rest of the country. On the contrary, it might be due to the population of the region receiving a more generous provision of curative facilities than the rest of the country's population. However, there are wide variations in hospital admissions between various parts of the region. Table 5 - 14 gives the admission numbers in various local council areas or groups of council areas located near each other. The general trend shows that the North Blue Nile sub-region accounts for the highest number of admissions in the region. In relation to population ratio this also constitutes a higher proportion of admission in this sub-region than in the other two sub-regions. The South Blue Nile sub-region is next highest in admission numbers and the White Nile sub-region has the least admission numbers in the region. This is not necessarily a true reflection of comparative health conditions between the various sub-regions. It may

TABLE 5 - 13

HOSPITAL ADMISSIONS IN PROVINCES OF THE SUDAN (1970).

SOURCES: Annual Statistical Report (1970): Statistics Division,

Ministry of Health, Khartoum.

Province	Hospital Admission (No. of cases admitted)
Northern Sector	
1. Blue Nile	61,212
2. Dar Fur	16,820
3. Kassala	22,720
4. Khartoum	50,210
5. Kordofan	33,120
6. Northern	27,110
Southern Sector	
7. Bahr El Ghazal	10,160
8. Equatoria	10,810
9. Upper Nile	9,896
Sudan	242,058

TABLE 5 - 14

HOSPITAL ADMISSIONS IN VARIOUS AREAS OF THE BLUE NILE PROVINCE (1971).

SOURCE: Annual Statistical Reports (1971), Blue Nile Health Office, Ministry of Health, Wad Medani and Sennar.

Local Councils (Rural Council or Municipality)	Hospital Admission (No. of cases admitted)
North Blue Nile	35,764
Meilig R.C.) Hasaheisa R.C.) Meheiriba R.C.)	7,879
Shukriya R.C.	5,146
Wad Medani M.	14,483
El Medina R.C.	2,599
El Hosh R.C.	1,200
Managil R.C.	4,457
South Blue Nile	18,044
El Roseires R.C.	3,863
Kurmuk R.C.	1,045
Sennar R.C.	6,660
Abu Hugar R.C.) Northern Fung R.C.)	5,135
Rufaa El Sharig R.C.	1,341
White Nile	14,465
Northern White Nile R.C.	8,240
Kosti R.C.	6,225
Province (Total)	68,273

rather indicate differences in provision of curative facilities between the different sub-regions. The distribution of resources and facilities which will be discussed in the following section may show to what extent this suggestion is justified.

5.3.0 HEALTH CARE RESOURCES IN THE REGION

There is no established criterion for the apportionment of medical resources or health service facilities to a certain population relative to its general state of health. Standards of provision differ from one country to another depending on the general wealth of the country and the share of that wealth allocated for health promotion. But whatever the share allocated for the promotion of health may be, it is the responsibility of those entrusted with health planning to see to it that scarce health care resources are equitably distributed within the country. Only through such equitable distribution of resources can optimum improvements to the community's health state be hoped for. In this section the distribution of medical care resources in the Blue Nile Province in relation to the rest of the country will be presented. The distribution of medical care resources within the Blue Nile Province will also be presented. Types of various curative institutions in the region will also be discussed.

5.3.1 The Blue Nile Province's Share of Medical Care Resources

Despite its relatively good health state and its relatively high population density, the Blue Nile Province has a greater number of curative institutions than any other province of the Sudan. Table 5 - 15 shows that over 25% of the total number of hospitals in the country are located in the Blue Nile

TABLE 5 - 15

DISTRIBUTION OF MEDICAL CARE INSTITUTIONS BY PROVINCE IN THE SUDAN (1970).

SOURCE: Annual Statistical Report (1970): Statistics Division, Ministry of Health, Khartoum.

Province	Hospitals No.	Hospitals Beds	Health Centres	Dispensaries	Dressing Stations
Northern Sector					
1. Blue Nile	25	2,647	24	171	426
2. Dar Fur	10	940	6	61	48
3. Kassala	8	1,535	13	62	114
4. Khartoum	9	2,403	28	34	50
5. Kordofan	13	1,344	11	73	151
6. Northern	14	1,271	24	102	176
Southern Sector					
7. Bahr El Ghazal	6	746	1	13	35
8. Equatoria	9	1,145	1	28	39
9. Upper Nile	4	751	1	39	40
Sudan (Total)	98	12,782	109	583	1,079

Province. It also shows that about 22% of all health centres and about 36% of all dispensary and dressing stations in the country are also located in that province. Only Khartoum Province has more health centres than the Blue Nile Province. However, when institutions are related to size of population, Table 5 - 16 shows that the Blue Nile Province has a population per hospital lower than all but two other provinces - Khartoum and Northern Provinces. As regards hospital beds, the Blue Nile Province occupies the median position. With regard to health centres, only Khartoum, Northern and Kassala Provinces have lower population-health centres ratios. With regard to dispensaries and dressing stations, only the Northern Province has a lower population-unit ratio.

As far as medical and nursing manpower is concerned, the Blue Nile Province, as shown in Table 5 - 17, has the highest number of medical assistants and midwives among the provinces of the country. In the number of doctors, dentists and nurses, the Blue Nile Province is surpassed only by Khartoum Province. When considering manpower in relation to population size, Table 5 - 18 shows that the population per manpower unit in the Blue Nile Province is much lower than in any of the provinces in the southern sector of the country; but when compared with other provinces in the northern sector, its ratio seems to be intermediate. It has a lower population-doctor ratio than either Dar Fur or Kordofan Provinces. It has a lower population-nurse ratio than either Dar Fur, Kordofan or Northern Provinces. It also has a lower population-midwife ratio and

TABLE 5 - 16

POPULATION PER MEDICAL CARE INSTITUTION (OR BEDS) IN PROVINCES OF THE SUDAN (1970).

SOURCE: Annual Statistical Report (1970): Statistics Division, Ministry of Health, Khartoum.

Province	Population per Hospital	Population per Hospital Bed	Population per Health Centre	Population per Dispensary or Dressing Station
Northern Sector				
1. Blue Nile	126,240	1,192	131,500	5,286
2. Dar Fur	196,400	2,089	327,333	18,018
3. Kassala	203,625	1,061	125,308	9,256
4. Khartoum	97,444	365	31,322	10,440
5. Kordofan	216,231	2,092	255,545	12,549
6. Northern	95,214	1,049	55,542	4,795
Southern Sector				
7. Bahr El Ghazal	237,633	1,913	1,427,000	29,729
8. Equatoria	144,778	1,138	1,303,000	19,448
9. Upper Nile	320,500	1,707	1,282,000	16,228
Sudan (Average)	161,041	1,235	144,789	9,496

(See Table 5 - 2 for 1970/71 population).

TABLE 5 - 17

DISTRIBUTION OF MEDICAL AND NURSING MANPOWER (PUBLIC SECTOR) BY PROVINCE IN THE SUDAN (1970).

SOURCE: Annual Statistical Report (1970): Statistics Division, Ministry of Health, Khartoum.

Province	Doctors	Dentists	Medical Assistants	Midwives	Nurses
Northern Sector					
1. Blue Nile	75	14	174	663	1,527
2. Dar Fur	26	3	67	127	583
3. Kassala	52	6	66	255	858
4. Khartoum	496	29	82	379	2,447
5. Kordofan	42	4	97	281	1,004
6. Northern	37	3	84	309	545
Southern Sector					
7. Bahr El Ghazal	15	-	14	14	303
8. Equatoria	27	1	23	72	383
9. Upper Nile	12	-	26	112	362
Total (Sudan)	782	60	631	2,152	8,052

TABLE 5 - 18

POPULATION PER MEDICAL AND NURSING MANPOWER UNIT IN PROVINCES OF THE SUDAN (1970).

Province	Pop. per Doctor (Public and Private)	Pop. per Dentist	Pop. per Medical Assistant	Pop. per Midwife	Pop. per Nurse
Northern Sector					
1. Blue Nile	31,000	225,000	18,138	4,790	2,066
2. Dar Fur	65,000	655,000	29,313	15,464	3,368
3. Kassala	24,000	272,000	24,682	6,388	1,898
4. Khartoum	1,000	30,000	10,695	2,314	835
5. Kordofan	54,000	703,000	28,979	10,003	2,799
6. Northern	28,000	444,000	15,869	4,314	2,445
Southern Sector					
7. Bahr El Ghazal	71,000	-	101,928	101,928	4,709
8. Equatoria	35,000	1,303,000	56,652	18,097	3,402
9. Upper Nile	67,000	-	49,308	11,446	3,541
Sudan (Average)	15,000	263,000	25,011	7,333	1,960

population-medical assistant ratio than either Dar Fur, Kordofan or Kassala Provinces. But only Khartoum Province has a lower population-dentist ratio.

As to public health manpower, the Blue Nile Province has the highest number of public health inspectors and officers among all the provinces. In respect of the number of sanitary overseers, it is surpassed only by Kassala Province. (See Table 5 - 19.)

5.3.2 Distribution of Medical Care Resources within the Blue Nile Province

Although the Blue Nile Province is amongst the provinces where a relatively high standard of medical care resources is provided, wide variation in the distribution of such resources exists between the different localities and sub-regions. Table 5 - 20 shows the distribution of medical care institutions in the Blue Nile Province. In general, the table reflects the wide variations between the North Blue Nile sub-region and either the South Blue Nile or White Nile sub-regions. It shows that, despite the fact that the North Blue Nile sub-region has a lower infant mortality ratio than either South Blue Nile or White Nile, and despite its higher population density, there are more hospitals, hospital beds, health centres, dispensaries and dressing stations located in the North Blue Nile sub-region than in the two other sub-regions combined. This obviously represents a bias in favour of North Blue Nile sub-region against the other two sub-regions. This

TABLE 5 - 19

DISTRIBUTION OF PUBLIC HEALTH MANPOWER BY PROVINCE IN THE SUDAN (1970).

SOURCE: Annual Statistical Report (1970): Statistics Division, Ministry of Health, Khartoum.

Province	Public Health Inspectors	Public Health Officers	Sanitary Overseers
Northern Sector			
1. Blue Nile	14	26	220
2. Dar Fur	4	11	100
3. Kassala	12	9	261
4. Khartoum	10	20	214
5. Kordofan	6	13	87
6. Northern	7	11	79
Southern Sector			
7. Bahr El Ghazal	4	7	23
8. Equatoria	3	3	18
9. Upper Nile	3	5	24
Sudan (Total)	63	105	1,026

TABLE 5 - 20

DISTRIBUTION OF MEDICAL INSTITUTIONS BY LOCALITY IN THE BLUE NILE PROVINCE (1971).

SOURCE: Annual Statistical Reports (1971): Blue Nile Health Office, Ministry of Health, Wad Medani and Sennar.

Local Councils (Rural council or Municipality)	Hospitals		Health Centres	Dispensaries	Dressing Stations
	No. of Hospitals	Total No. of Beds			
North Blue Nile	15	1,673	15	89	266
Meilig R.C.	1	242	1	14	32
Meheiriba R.C. (	-	-	-	7	19
Hasaheisa R.C. (	3	220	4	17	51
Shukriya R.C. (	2	189	1	9	40
Rufaa M. (	-	-	-	-	-
El Medina R.C. (	2	80	2	13	40
Wad Medani M. (	1	712	5	-	11
El Hosh R.C.	1	60	1	14	46
Managil R.C.	2	170	1	15	27

TABLE 5 - 20

...CONTINUED

Local Councils (Rural council or Municipality)	Hospitals		Health Centres	Dispensaries	Dressing Stations
	No. of Hospitals	Total No of Beds			
South Blue Nile	6	681	6	36	134
El Roseires R.C.	2	170	1	8	32
Kurmuk R.C.	1	60	-	4	10
Sennar R.C.	1	193	2	11	42
Abu Hugar R.C. (	-	-	-	-	-
Northern Fung R.C. (	1	198	3	12	34
Rufaa El Sharig R.C.	1	60	-	1	16
White Nile	5	558	8	48	88
North White Nile R.C.(	2	140	4	35	51
Dueim M. (	1	182	-	-	-
Kosti R.C. (	1	25	4	13	37
Kosti M. (	1	211	-	-	-
Blue Nile (Total)	26	2,912	29	173	488

bias is confirmed by the fact that North Blue Nile sub-region has less population than South Blue Nile and White Nile sub-regions combined (See Table 5 - 3.). Furthermore, transport facilities in North Blue Nile are more abundant than in either South Blue Nile or White Nile sub-region.

As far as medical and nursing manpower is concerned, maldistribution is also clear when Table 5 - 21 is examined. The table shows that there are more doctors, medical assistants and nurses in North Blue Nile alone than in the other two sub-regions combined. This maldistribution in medical and nursing manpower is largely due to the high concentration of doctors and nurses in Wad Medani regional hospital which is situated in the North Blue Nile sub-region. No similar hospital exists in either South Blue Nile or White Nile sub-regions.

5.3.3 Types of Curative Institutions in the Blue Nile Province

Broadly speaking curative institutions in the Blue Nile Province can be classified into two main types according to the kind of care provided:-

1. Institutions providing mainly ambulatory care.
2. Institutions providing mainly residential care.

The ambulatory care institutions include dispensaries and dressing stations in addition to health centres, while the residential care institutions comprise only hospitals. The former institutions are usually smaller in size and more poorly provided with medical staff, equipment and medicine than the

TABLE 5 - 21

DISTRIBUTION OF MEDICAL AND NURSING MANPOWER BY LOCALITY IN THE BLUE NILE PROVINCE (1971).

SOURCE: Annual Statistical Reports (1971): Blue Nile Health Office, Ministry of Health, Wad Medani and Sennar.

Local Councils (Rural council or Municipality)		Doctors	Medical Assistants	Nurses
North Blue Nile		64	95	1,072
Meilig R.C.	(	2	13	131
Meheiriba R.C.	(	-	6	20
Hasaheisa R.C.	(	6	18	142
Shukriya R.C.		4	10	151
El Medina R.C.	(	2	12	80
Wad Medani M.	(	46	10	367
El Hosh R.C.		1	12	68
Managil R.C.		3	14	113

TABLE 5 - 21

...CONTINUED

Local Councils (Rural council or Municipality)	Doctors	Medical Assistants	Nurses
South Blue Nile	12	29	480
El Roseires R.C.	2	5	113
Kurmuk R.C.	1	1	54
Sennar R.C.	5	10	131
Abu Hugar R.C. (	-	-	-
Northern Fung R.C. (	3	12	134
Rufaa El Sharig R.C.	1	1	48
White Nile	15	52	319
North White Nile R.C.	6	35	157
Kosti R.C.	9	15	162
Blue Nile (Total)	91	176	1,871

latter. The latter institutions, on the other hand, vary considerably in their facilities for medical care. The Ministry of Health has classified hospitals in three types. In general the classification reflects the number of the hospital beds they contain. Hospitals having less than 100 beds are usually classified as type "C" hospitals, those having between 100 - 200 beds are classified as type "B" hospitals, and those having more than 200 beds are classified as type "A" hospitals.(1) Table 5 - 22 shows the yearly expenditures on main items in various types of hospitals in the Blue Nile Province. The table reflects wide variations in items of yearly expenditure as well as in the total yearly expenditures of hospitals. But it can be seen that there is progressively lower yearly expenditure as the class type of hospital becomes lower. Class A hospitals have the highest expenditure, followed by Class B and Class C hospitals. A few deviations from this general pattern occur. Although, according to the table, Abu Ushar hospital has a number of beds sufficiently high to warrant its inclusion in the type A class, its yearly expenditure is lower than several of the hospitals in the type B class. This, however, does not necessarily imply that Abu Ushar hospital delivers a lower quality of care than that delivered by a type B hospital. Table 7 - 7 presented later in chapter 7, will show that the number of patients visiting this hospital in a year is comparatively much lower than all hospitals in type B and

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(1) For the location of these hospitals see Map 5 - 4.

MAP 5 - 4

HOSPITAL DISTRIBUTION IN BLUE NILE PROVINCE

MAP 5-4

HOSPITAL DISTRIBUTION IN BLUE NILE PROVINCE (1972)

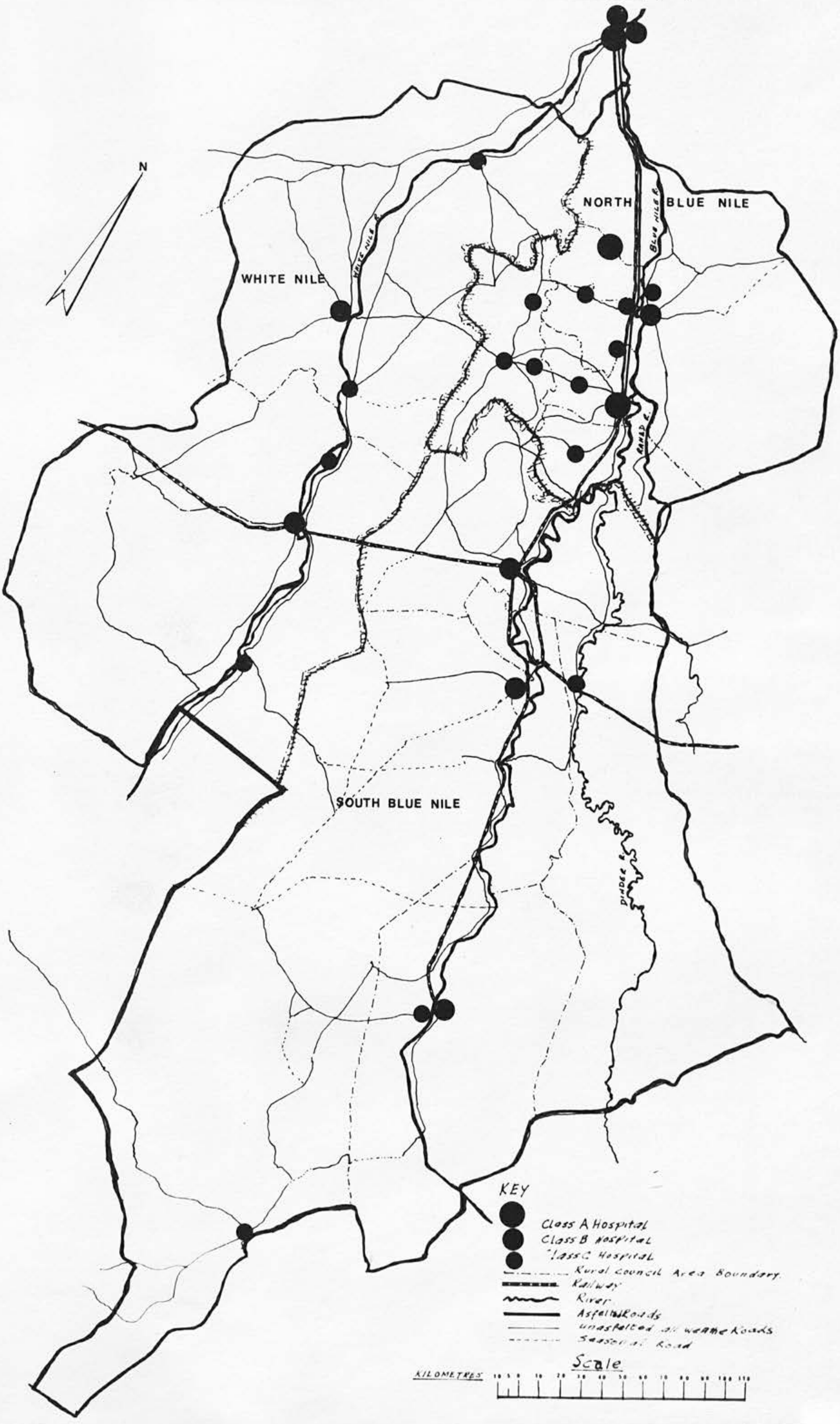

TABLE 5 - 22

YEARLY EXPENDITURE IN VARIOUS HOSPITAL TYPES IN BLUE NILE PROVINCE (1970/71).

SOURCE: Accounts Section, Ministry of Health, Khartoum (1971).

Hospital	No. of beds	Medical Staff Salaries in LS	Drugs, Equipments and Foods in LS	Other facilities and salaries in LS	Total Expenditure in LS
Class A Hospitals					
Wad Medani	680	167,250	119,109	130,015	416,374
Abu Ushar	268	21,550	19,953	39,022	80,525
Class B Hospitals					
Kosti	257	41,330	27,984	41,972	111,286
Rufaa	124	22,200	17,140	27,453	66,793
Dueim	146	24,050	14,861	21,177	60,088
Singa	178	34,000	22,738	43,320	100,058
Sennar	172	36,550	26,726	35,981	99,257
Roseires	110	13,900	12,166	25,008	51,074

TABLE 5 - 22

...CONTINUED

Hospital	No. of beds	Medical Staff Salaries in LS	Drugs, Equipments and Foods in LS	Other facilities and salaries in LS	Total Expenditure in LS
Class C Hospitals					
Managil	68	18,450	2,120	20,476	41,046
24. Qurashi	78	14,950	8,432	9,194	32,576
El Geteina	160	11,350	7,254	19,367	37,971
El Huda	34	8,200	13,271	9,612	31,083
El Kawa	40	9,350	5,527	11,316	26,193
El Damazin	68	8,850	8,852	12,599	30,301
El Dinder	60	8,550	4,940	11,275	24,765
El Kurmuk	60	9,700	5,567	16,212	31,719
El Gezira Aba	25	8,250	6,440	10,874	25,564
El Hosh	60	10,000	3,232	1,966	15,198
El Medina	25	3,500	4,600	795	8,895

quite a few of those in type C. Table 5 - 22 also implies that hospitals of type C deliver a lower quality of care than hospitals of type B. However, Table 7 - 7 shows that the majority of hospitals in type C are visited by fewer patients than those in type B. Further details on the quality of care delivered by hospitals in the region are given when the manpower in each hospital is presented.

Table 5 - 23 shows the distribution of manpower in hospitals in the Blue Nile Province. It demonstrates that Wad Medani Hospital is far superior in manpower strength to either Class B or C hospitals. In the case of Abu Ushar Hospital, however, the size of manpower does not seem to be greater than most hospitals in type B; but on considering the comparatively fewer number of annual visits to this hospital (See Table 7 - 7 in Chapter 7), this manpower size can still qualify it to be included in the type A category. The table also shows that Wad Medani Hospital as a Class A hospital has far more specialists and general doctors than are to be found in any other hospital in the region. It can also be seen from this table that most Class B hospitals have some specialist doctors while none of the Class C hospitals has any specialists. It can also be seen from the same table that all Class C hospitals are one-doctor hospitals while amost all Class B hospitals have more than one doctor. But despite the variation between Class B and C hospitals, the quality of care delivered from these two types is remarkably similar as can be judged from an examination of the cost-equivalent of the visits in the different

TABLE 5 - 23

DISTRIBUTION OF MANPOWER IN VARIOUS HOSPITALS IN BLUE NILE PROVINCE.

SOURCE: Annual Statistical Reports (1971): Blue Nile Health Office, Ministry of Health, Wad Medani and Sennar.

Hospital	Doctors		Medical Assistants	Nursing Staff		Technicians	Non-Medical Staff
	Specialists	General		Ward Nurses	Auxiliary		
Class A Hospitals							
Wad Medani	16	30	9	255	119	23	105
Abu Ushar	-	2	3	100	39	3	27
Class B Hospitals							
Kosti	3	5	5	97	37	10	38
Rufaa	1	3	2	100	25	2	20
Dueim	1	3	3	80	30	4	25
Singa	-	3	6	90	38	5	19
Sennar	1	4	4	80	26	4	30
Roseires	-	1	2	49	23	3	19

TABLE 5 - 23

...CONTINUED

Hospital	Doctors		Medical Assistants	Nursing Staff		Technicians	Non-Medical Staff
	Specialists	General		Ward Nurses	Auxiliary		
Class C Hospitals							
Managil	-	1	2	49	16	3	22
24. Qurashi	-	1	3	40	19	2	16
El Geteina	-	1	1	30	19	2	17
El Huda	-	1	1	21	7	2	16
El Kawa	-	1	1	23	10	1	17
El Damazin	-	1	2	23	11	2	16
El Dinder	-	1	1	31	9	2	17
El Kurmuk	-	1	1	40	13	2	14
El Gezira Aba	-	1	1	17	10	2	15
El Hosh	-	1	-	31	15	2	15
El Medina	-	1	-	18	7	2	15

hospitals within these types[1] (to be discussed later in Chapter 7).

(1) Cost-equivalent of a visit to a hospital refers to the average cost of a visit as computed by dividing the total yearly running cost of a hospital by the total yearly number of visits made to the hospital (See Table 7 - 7 in Chapter 7.).

5.4.0 SUMMARY AND IMPLICATIONS

In this chapter the characteristics of the region under study have been outlined. Under the general characteristics the geographical features, the administrative set-up and the demographic structure and social background of its people have been defined. It can be concluded that the Blue Nile region has unique characteristics in relation to other regions in the country. The health state of the people in the region has also been described with reference to mortality, morbidity and hospital admissions. It appears that despite the inadequacies of these factors as measures of health levels, the Blue Nile region has better health level than most regions in the country. Variations of health levels in various parts of the region result from the region not being completely homogeneous in its health conditions. Health care resources and types of various curative institutions in the region have also been compared with those in other regions. It appears that despite its relatively good health level, the Blue Nile region has more generous provision of curative resources than most regions in the country. Variations within the region have shown that maldistribution of these resources in various parts of the region is obvious. Variations within the types of curative institutions have revealed that there are basic differences in the quality of curative care as delivered by various types of institutions and various types of hospitals within these institutions.

In the following chapter, the survey procedure will be presented. The survey provides the data for analyses of health needs and demands for various types of curative care. It is hoped that the results of such analyses will pave the way for planning a more effective and equitable distribution of curative care facilities in the Blue Nile region.

CHAPTER 6

THE SURVEY

CONTENTS Page

6.0.0 THE SURVEY

The various methods adopted for planning the distribution of curative facilities reviewed in Chapter 4, indicated that there was no clear distinction between needs for curative care and demands for curative facilities. In most cases, need was ignored and accordingly, the planning and distribution of curative facilities was reduced only to the satisfaction of demands. The theoretical discussion presented in Chapters 1, 2 and 3 has demonstrated that several factors are involved in the determination of various aspects connected with the distribution of curative care. Chapter 3 in particular pointed out that, in order to achieve an optimum and equitable distribution of curative facilities, more understanding of the factors that shape need for curative care and of those that influence demand for curative care, is needed. In the Blue Nile Province, as in most regions in underdeveloped countries, the concept of need for curative care, as a pre-requisite for planning of medical facilities has never been examined. Accordingly, the relationships between demands for curative facilities and the needs for curative care have never been evaluated. While there is adequate information in the hospital records of the Blue Nile Province on the extent of demands and the use of curative institutions, there is no knowledge of the extent of the needs that motivate such demands. For this reason, a comprehensive survey of needs and demands for medical care as well as of the factors that are hypothesized to influence both in the Blue Nile Province was deemed necessary for this study.

Such a sample survey in the Blue Nile Province was undertaken by the researcher during 1971/72. The preliminary step required the selection of an appropriate sample of settlements. Thereafter the survey was carried out in two stages with the help of 30 students from the University of Khartoum and four supervisors from the Ministry of Housing in Khartoum. The first stage of the survey involved the selection of a sample of households within the selected sample of settlements in addition to investigations related to macro-environmental and accessibility factors in the selected areas. In the second stage which was carried out six months later, detailed information on needs and demands for curative care as well as various demographic, socio-economic and micro-environmental factors, was secured through interviews with the members of the households selected in the first stage.

In this chapter three main aspects of the survey will be presented, i.e. the sampling procedure, the interview procedure and the various characteristics of the sampled households as revealed by the survey.

6.1.0 THE SAMPLING PROCEDURE

In order to be able to derive some valid conclusions, the regional survey must be representative of the people of the Blue Nile Province. Obviously, the best way of representing the people of the Blue Nile Province would be through a complete survey of the whole province. Such a complete survey was an impossibility in view of the limitations on the researcher's time and funds. However, a carefully worked out sample survey can produce an equally valid representation of the people of the Blue Nile Province. In such a case, the reliability of findings usually increases with the sampling ratio. However, the sampling ratios selected in this sample survey were very much geared to what could be accomplished successfully within the researcher's limited time and funds. This limitation should be appreciated when judging the findings of this study.

The sampling procedure is presented under the two headings of sampling plan and sampling execution.

6.1.1 Sampling Plan

The ultimate objective of the Sampling Plan was to draw a certain number of households which would represent as far as possible the total households in the Blue Nile Province. This was done through a two-stage ratio sampling method. In order to ensure an adequate representation of various areas and different types of settlements, three sample frames were suggested. Each frame represented a different category of settlement. The three categories considered in the frame were rural, semi-urban or small towns, and urban settlements or major cities. In order to ensure adequate representation for the different households, varying ratios were used in connection with each of the three categories of settlement:-

1. Rural Areas

For the purpose of local administration, the Blue Nile Province is divided into rural councils. However, in the lower hierarchy of the administrative set-up, each rural council is divided into "omodias" and each omodia into "sheikhships". In most cases a sheikhship comprises one or two villages. The list of sheikhships in the Blue Nile formed the sampling frame for the rural areas. Such a list was recently made in connection with the census of agriculture (1968), and has now been brought up-to-date by the Department of Statistics in Khartoum (See Table 6 - 1.). The first stage of sampling in the rural area of the province was the selection of sheikhships with a probability proportionate to their size. It was decided that the number of sheikhships to be covered in the sample would be determined at the rate of one such sheikhship for every 4,000 rural households. This gives an overall sample of 79 sheikhships in the rural area of the Blue Nile Province. In the second stage of sampling, a random sample of households was drawn from each of the selected sheikhships. Although the sheikhships are of varying sizes, for the purpose of simplifying the process, a uniform ratio of households was drawn from each selected sheikhship. It was decided that from each selected sheikhship 10 households would be randomly selected. This would give an overall sample of 790 rural households.

2. Semi-Urban Areas

According to the 1964/65 population and housing survey,

TABLE 6 - 1

DISTRIBUTION AND AVERAGE SIZE OF SHEIKHSHIPS BY RURAL COUNCILS IN THE BLUE NILE PROVINCE.

SOURCE: Census of Agriculture in the Sudan, Department of Statistics, Khartoum (1965).

Rural Council	No. of Sheikhships	Average No. of Households in a Sheikhship
Meilig R.C.	194	88
Shukriya R.C.	263	124
Meheiriba R.C.	117	95
Hasaheisa R.C.	194	89
El Medina R.C.	190	104
El Hosh R.C.	313	74
Managil R.C.	290	80
Sennar R.C.	518	63
Northern Fung R.C.	226	92
Abu Hugar R.C.	258	55
Rufaa El Sharig R.C.	168	63
El Roseires R.C.	231	97
Kurmuk R.C.	102	74
Kosti R.C.	201	235
North White Nile R.C.	523	146
Province (Total)	3788	

28 settlements in the Blue Nile Province were classified as semi-urban areas or small towns. These settlements generally have populations ranging between 5,000 and 20,000 persons. However, some settlements having populations lower than this range are included in this category when they function as local administrative centres. Table 6 - 2 gives a list of these settlements with their estimated number of households. The first stage in sampling the semi-urban areas of the province was the selection of semi-urban settlements with a probability proportionate to their size. It was decided that the number of semi-urban settlements to be covered in the sample would be on the basis of one such settlement for every 4,000 households living in semi-urban areas. This gives an overall sample of 10 semi-urban settlements in the Blue Nile Province. In the second stage of sampling, a random sample of households was drawn from each of the selected settlements. In order to simplify the process, a uniform ratio was, again, proposed. Thirty households were randomly selected from each selected settlement. This gives an overall sample of 300 semi-urban households.

3. Urban Areas

The Blue Nile Province has only two urban areas or major cities, i.e. Wad Medani and Kosti towns. In 1972 Wad Medani was estimated to have a population of about 75,000 persons, i.e. about 15,000 households, while Kosti was estimated to have a population of about 37,860 persons, i.e. about

TABLE 6 - 2

SETTLEMENTS CLASSIFIED AS SEMI-URBAN OR SMALL TOWN IN THE BLUE NILE.

SOURCE: Population and Housing Survey, Blue Nile Province - 1964/65.

Settlement	Estimated Number of Households (1965)
1. Sennar	2940
2. Dueim	2647
3. Singa	2578
4. Rufaa	2522
5. El Suki	2115
6. Hasaheisa	2010
7. Tendelti	1717
8. El Roseires	1217
9. Kamlin	1088
10. Messalamya	858
11. Kurmuk	590
12. Gezira Aba	2778
13. Rabak	1980
14. Mairno	1277
15. El Damazin	1267
16. Um Shoka	1247
17. El Managil	1083
18. Galgani	1047
19. El Huda	987
20. Karkug	853
21. Abu Hugar	660
22. Dinder	605
23. El Hosh	548
24. El Medina Arab	482
25. El Giteina	637
26. Wad El Nail	535
27. Abu Neama	442
28. El Kawa	322
Province (Total)	38697

7,500 households. These population estimates were used as the basis for sampling. In the first stage of sampling it was decided that both towns should be selected to represent urban areas of the province. In view of the great heterogeneity among the urban population, a larger ratio of households was decided upon for the second stage of sampling. Accordingly, the total sample size adopted for the major cities works out at the rate of 20 households for every 1,000 households living in each city. This gives a sample of 300 households in the case of Wad Medani and 150 households in the case of Kosti.

According to this Sampling Plan a total sample of 1,540 households was drawn from the whole province to represent the various characteristics of its population.

6.1.2 Sampling Execution

The execution of the Sampling Plan was carried out in two stages. In the first stage, the sample of sheikhships and other settlements in the semi-urban and urban categories was conducted by the researcher with the help of some members of the Department of Statistics in Khartoum prior to the start of the field work. 79 sheikhships or villages, 10 semi-urban or small towns and two urban centres or major cities were selected according to plan. The names and distribution of the selected villages by rural councils are given in Table 6 - 3. Thirty-seven of these settlements are located in the North Blue Nile sub-region, nineteen in the South Blue Nile sub-region and twenty-three in the White Nile sub-region. Such a distribution

TABLE 6 - 3

NAMES, SIZES AND DISTRIBUTION OF SAMPLED SHEIKHSHIPS "VILLAGES" ACCORDING TO RURAL COUNCILS IN THE BLUE NILE PROVINCE.

Rural Council	Name of Selected Sheikhship or village	Estimated Number of Households
Meilig R.C.	1. El Meilig	327
	2. El Tikeina	359
	3. Barakat	83
	4. El Shagaig Bargo	71
	5. Wad El Magdi	202
Shukriya R.C.	1. Tekelat	70
	2. Hadalil	126
	3. Idd El Hag	165
	4. Sayal Fatir	116
	5. El Ganomab	97
	6. Tabi	134
	7. Fatiha El Eishab	199
	8. Amarat El Bana	286
	9. Tabib Abu Khreiz	154
Meheiriba R.C.	1. Aftas	214
	2. Um Hamad	121
	3. Taybat El Sheikh El Ghorashi	279
Hasaheisa R.C.	1. Amarat El Gaaliyn	397
	2. El Fereigab	80
	3. Goz Ahmed Nur	155
	4. Tabat El Sheikh A/Mahmoud	488
El Medina R.C.	1. El Soreiba	235
	2. El Higeiliga	140
	3. El Hilewa	59
	4. El Azaza	168
El Hosh R.C.	1. El Dasis	82
	2. El Sherif Yaagoub	313
	3. El Sherif Mukhtar	274
	4. Gismalla	139
	5. El Shukaba El Nur	120

TABLE 6 - 3

..CONTINUED

Rural Council	Name of Selected Sheikhship or village	Estimated Number of Households
Managil R.C.	1. El Fikheikhir El Taif	184
	2. Um Gargur	80
	3. Um Zikra El Obeid	238
	4. El Himeig	185
	5. Um Digheina - South	139
	6. Goz Halawi	82
	7. El Gileia El Mahal	137
Sennar R.C.	1. El Sherif Bagbug	68
	2. Um Gidian	277
	3. Um Rihaba	120
	4. Ban Naga	95
	5. Digeis	51
	6. El Baniya	23
Northern Fung R.C.	1. Wad El Gizoli	101
	2. Mina Yousif	108
	3. El Lakandi	212
	4. El Manofali	85
Abu Hugar R.C.	1. El Kiteir	31
	2. Seiro El Marabia	45
Rufaa El Sharig R.C.	1. Khimeisa	142
El Roseires R.C.	1. Bordabeil	158
	2. El Aradeiba	89
	3. Um Darfa	124
	4. El Fadimiya	246
Kurmuk R.C.	1. El Gindi	107
	2. Gurut	116

TABLE 6 - 3

..CONTINUED

Rural Council	Name of Selected Sheikhship or village	Estimated Number of Households
Kosti R.C.	1. Bashouk - El Adara	183
	2. Idd El Gim	22
	3. Tendelti Group	530
	4. El Karo El Hassaniya	129
	5. El Migeinis	500
	6. Gulli	157
	7. El Aleiga El Bashir	140
	8. Karari El Tiweimat	384
	9. El Marabia	400
	10. El Rasrasa	200
	11. Abu El Dakhira	106
North White Nile R.C.	1. Maatoug	133
	2. El Higeir	26
	3. Neima	190
	4. El Siheiba	120
	5. Goz Marafeeb	84
	6. El Dambo	131
	7. Maaza	160
	8. El Sheikh El Hussein	190
	9. Salim	54
	10. Kitrat El Dagala	732
	11. El Arshakol	206
	12. El Sheikh El Sidig	114

almost corresponds to the proportional distribution of the total number of rural population in these sub-regions. Table 6 - 4 gives the names and the distribution of the selected semi-urban settlements by sub-region in the province. Three of these settlements are located in the North Blue Nile sub-region, five in the South Blue Nile sub-region and two in the White Nile sub-region. Such a distribution again almost corresponds to the proportional distribution of the semi-urban population in the three sub-regions.

The second stage of the sampling was carried out with the help of students from the University of Khartoum as part of the field investigation on the selected settlements. The universe from which the sample of households was drawn was obtained from the tax records in the case of urban and semi-urban settlements. The households are usually identified by the house numbers, block numbers and neighbourhood names. These households were serially numbered according to the order in which they appear in the record book, and the appropriate number of households was selected from each settlement using a list of random figures. In the case of sheikhships or villages, such a record of households was not available, and therefore the universe of households in each rural settlement was obtained by listing all the households in each settlement with the help of the village sheikh. The households in each settlement were identified by the names of heads of households. These lists were serially numbered and a random sample of the appropriate size was drawn from each list using a list of random figures.

TABLE 6 - 4

NAMES AND DISTRIBUTION OF SELECTED SEMI-URBAN SETTLEMENTS ACCORDING TO SUB-REGIONS OF THE BLUE NILE PROVINCE.

Sub-region	Name of Selected Semi-urban Settlement (small towns)
North Blue Nile	1. El Kamlin Town 2. El Hosh Town 3. Rufaa Town
South Blue Nile	1. Sennar Town 2. Singa Town 3. El Suki Town 4. Karkug Town 5. El Roseires Town
White Nile	1. Rabak Town 2. El Dueim Town

After the completion of the sampling procedure the selected households were visited by members of the team of interviewers. The names of the permanently resident household members, their sexes, ages and status in the household were noted down. As a preliminary introduction to the detailed interviews which would be carried out in the second stage of the survey, the purpose of the survey was explained to each of the selected households. A list of diary sheets was deposited with the head of each selected household with the name, sex and age of each member of his household printed in each. The purpose of these diary sheets was to keep a record of the symptoms of any kind of health complaint felt by members of the household, and of the kind of treatment they sought from the time these diary sheets were issued and until they were recovered by the interviewers in the second stage of the survey six months later. These diary sheets were envisaged as reminders for household members when later they were being asked about their health conditions and their illness behaviour. An example of such a diary sheet is presented in Appendix A.

In the next section the interview procedure will be presented.

6.2.0 THE INTERVIEW PROCEDURE

In order to secure information on the characteristics of the selected households and their health conditions as well as their illness behaviour, direct interview with members of each selected household in the region was necessary. Such interviews were carried out in the second stage of the investigations with the help of students from the University of Khartoum. In the first stage of investigation, the same team of students helped in securing information on the macro-environmental condition of the sampled settlements together with accessibility information and the location of curative institutions of all types in relation to these settlements. The items investigated at this first stage are of a general nature and will be presented in form A in Appendix A.

The interview procedure is presented here under the two headings of questionnaire design and household interviews.

6.2.1 Questionnaire Design

The questionnaire form was designed in order to obtain five main types of information from each of the selected households in the Blue Nile Province. These are:-

1. Information on the demographic composition of the household;
2. Information on the socio-economic condition of the household;
3. Information on the environmental living condition

within the house in which the household members reside;

4. The health condition of each member of the household during a whole year; and
5. The illness behaviour of each member of the household during that year.

Such information, in addition to the one secured during the stage of settlement investigations, provides a comprehensive description of each household in the region as to its health situation. This makes it possible to analyze in more detail both the health condition and the use of available curative facilities in the region. The contents of the questionnaire form (Form B) are given in Appendix A.

6.2.2 Household Interviews.

The interviews were carried out with the help of 30 students from the University of Khartoum and four supervisors from the Ministry of Housing as was pointed out earlier. In order to avoid seasonal variation, it was decided that the work should be started at the same time in all parts of the region. Accordingly, the interview team was divided into three smaller teams, each being responsible for one of the three sub-regions of the province, i.e. North Blue Nile, South Blue Nile and White Nile sub-regions. The Number of interviewers allocated for each sub-region depended on the size of households to be covered. Each of the three teams was accompanied by a supervisor. The researcher's time was divided between the three teams in order to see that work was proceeding as planned. Each team was briefed on the conduct of the interviews and on the difficulties that might be encountered.

The interviews proceeded very satisfactorily and the whole sample was covered in one and a half months. Of the original 1,540 households sampled, 1,466 responded. Only 74 households (i.e. 4.8%) were either missing or refused to give answers. The distribution of respondents and non-respondents by sub-region is given in Table 6 - 5. It is noted that the response was highest in the White Nile sub-region, i.e. 96.4%, medium in the South Blue Nile sub-region, i.e. 95.6%, and lowest in the North Blue Nile sub-region, i.e. 94.3%.

TABLE 6 - 5

DISTRIBUTION OF RESPONDENTS AND NON-RESPONDENTS ACCORDING TO SUB-REGION IN THE BLUE NILE PROVINCE.

Sub-region	Total Number of Sampled Households	Number of Responding Households	Number of Non-Responding Households
North Blue Nile	760	717	43
South Blue Nile	340	325	15
White Nile	440	424	16
Province (Total)	1540	1466	74

6.3.0 GENERAL CHARACTERISTICS OF THE SAMPLED HOUSEHOLDS

On examining the general findings of the survey, wide variations in the characteristics of households were apparent. According to the survey, two types of household characteristics are identifiable, i.e. quantitative and qualitative characteristics. The former are those which can be described in terms of numerical figures, i.e. size, length, percentage, etc. The latter are those which can be described by their quality rather than quantity (descriptive), i.e. available or not available, etc. In order to reflect the extent of variation in the quantitative characteristics of the households in the sample, Table 6 - 6 is presented. Most of the characteristics appearing in this table describe the demographic composition of the sampled households. Other characteristics in the table describe the socio-economic structure, the micro-environmental condition and the accessibility situation to curative institutions, of the sampled households. The extent of variations in the sample is given by reference to the maximum value, the minimum value, the mean value and the range of each characteristic of the sample. Table 6 - 7 reflects the extent of variation in the qualitative characteristics of the households in the sample. It is noted that only with respect to the characteristics describing the educational level of mother, that describing the educational level of oldest member, that describing the frequency of cleaning the habitable rooms and that describing the frequency of cleaning the outer area of the house, is the variain the sample small. In 93% of the households in the sample, the educational level of the mother is below intermediate school level. In 83.5% of the households, the oldest member is either the head of the household or the mother, while among the 16.5% of the remaining households, 14.3% of the oldest members have no education. In the case of the two characteristics describing the cleaning of habitable rooms and outer areas, almost all the households are reported to have regular cleaning at least once a week (99.3% and 94.4% respectively). With respect to almost all other qualitative characteristics, the extent of variation is quite considerable. These wide variations in both the qualitative and the quantitative characteristics of the sample may have great impacts on both the health condition and illness behaviour in the Blue Nile Province.

TABLE 6 - 6

OBSERVED RANGES AND MEAN OF VARIOUS QUANTITATIVE CHARACTERISTICS AS REVEALED BY THE SURVEY IN THE BLUE NILE PROVINCE.

Characteristics	Max. Value	Min. Value	Mean Value	Range
Demographic Composition				
1. Household size	30.00	1	6.87	29.00
2. Household sex composition (% males)	100.00	0	49.18	100.00
3. % age group 1 year and below	33.33	0	2.60	33.33
4. % age group 5 years and below	71.43	0	17.95	71.43
5. % age group 17 years and below	90.00	0	48.57	90.00
6. % age group 40 years and above	100.00	0	18.75	100.00
7. % age group 50 years and above	100.00	0	10.12	100.00
8. % females at child-bearing age	100.00	0	37.91	100.00
Socio-economic structure				
1. Household income (in LS)	5 880.00	0	401.26	5 880.00
2. % children enrolled in schools	100.00	0	39.43	100.00

TABLE 6 - 6

..CONTINUED

Characteristics	Max. Value	Min. Value	Mean Value	Range
Micro-environmental condition				
1. Room occupancy (persons/room)	13.00	0.17	3.18	12.83
Accessibility to general curative institutions				
1. Distance to nearest Class A Hospital (kms)	550.00	0	123.91	550.00
2. Distance to nearest Class B Hospital (kms)	168.00	0	21.38	168.00
3. Distance to nearest Dispensary or Dressing Station	140.00	0	1.99	140.00

TABLE 6 - 7

PERCENTAGE DISTRIBUTION OF VARIOUS QUALITATIVE CHARACTERISTICS AS REVEALED BY THE SURVEY IN THE BLUE NILE PROVINCE.

Characteristic	Nature of the characteristic	Percentage Distribution in the sample
Socio-economic structure		
1. Occupation of Head of Household	a. No occupation	6.0
	b. Farmer	38.7
	c. Farm labourer	1.6
	d. Merchant	16.6
	e. Skilled labourer	14.1
	f. Unskilled labourer	10.5
	g. Clerical employee	8.1
	h. Professional or Managerial employee	4.3
2. Educational level of Head of Household	a. No education	32.1
	b. "Khalwa" or Nursery	26.5
	c. Primary school	27.5
	d. Intermediate school	7.3
	e. Secondary school	4.4
	f. University or college	2.3
3. Educational level of Mother or Principal Woman in Household	a. No education	77.4
	b. "Khalwa" or Nursery	1.8
	c. Primary school	13.6
	d. Intermediate school	2.0
	e. Secondary school	0.8
	f. University or college	0.1
	g. No woman or mother is head of household	4.2
4. Educational level of Oldest member in the Household other than Head or Mother	a. No education	14.3
	b. "Khalwa" or Nursery	1.4
	c. Primary school	0.7
	d. Intermediate school	0.1
	e. Secondary school	0.0
	f. University or college	0.0
	g. Oldest member either Head or Mother	83.5

TABLE 6 - 7

..CONTINUED

Characteristic	Nature of the characteristic	Percentage Distribution in the sample
Micro-environmental condition		
I. Availability of Facilities:		
1. Water closet or latrine	a. Available	54.3
	b. Not available	45.7
2. Separate bathroom	a. Available	44.3
	b. Not available	55.7
3. Separate kitchen	a. Available	67.7
	b. Not available	32.3
4. Food storage or fridge	a. Available	16.2
	b. Not available	83.8
5. Water tap inside	a. Available	46.2
	b. Not available	53.8
II. Sanitation, cleanliness and quality:		
6. Drainage of waste water	a. Good	55.0
	b. Bad	45.0
7. House cleanliness	a. Loose animals within	51.0
	b. No loose animals within	49.0
8. Quality of House Structure	a. Built of straw-reed	18.3
	b. Built of mud or mud-bricks	49.5
	c. Built of red bricks or concrete	32.3
9. Wiremesh in room windows	a. Available	60.6
	b. Not available	39.4

TABLE 6 - 7

..CONTINUED

Characteristic	Nature of the characteristic	Percentage Distribution in the sample
10. Wiremesh in kitchen windows	a. Available	23.1
	b. Not available	44.6
	c. Not applicable	32.3
11. Cleaning of habitable rooms	a. Not cleaned at all	0.0
	b. Cleaned once a week	99.3
	c. Cleaned once a fortnight	0.6
	d. Cleaned once a month	0.1
12. Cleaning of outer area	a. Not cleaned at all	2.1
	b. Cleaned once a week	94.4
	c. Cleaned once a fortnight	2.7
	d. Cleaned once a month	0.8
Macro-environmental setting		
1. Sub-region	a. North Blue Nile	48.9
	b. South Blue Nile	22.2
	c. White Nile	28.9
2. Residence	a. Rural non-farm	13.8
	b. Rural farm	38.7
	c. Semi-urban	19.3
	d. Urban	28.2
Curative Environment		
3. General Curative Facility available	a. Hospital Class A	18.6
	b. Hospital Class B	19.4
	c. Hospital Class C	2.4
	d. Dispensary	14.7
	e. Dressing station	22.2
	f. No curative facility	22.7
4. Health centre or Maternity Clinic	a. Available	44.3
	b. Not available	55.7

TABLE 6 - 7

..CONTINUED

Characteristic	Nature of the characteristic	Percentage Distribution in the sample
5. Special Non-General Hospital	a. Available b. Not available	20.5 79.5
6. Private Doctor's Clinic	a. Available b. Not available	45.6 54.4
7. Drugstore or Pharmacy	a. Available b. Not available	34.2 65.8
8. Local Healer	a. Available b. Not available	63.2 36.8
Public and Preventive Health Environment		
9. Regular Rubbish Collection	a. Carried out b. Not carried out	61.7 38.3
10. Regular Street Cleaning	a. Carried out b. Not carried out	61.7 38.3
11. Rain water disposal	a. Adequate b. Not adequate	53.1 46.9
12. Regular Stagnant Water Treatment	a. Carried out b. Not carried out	58.3 41.7
13. Piped drinking water system	a. Available b. Not available	55.3 44.7

TABLE 6 - 7

..CONTINUED

Characteristic	Nature of the characteristic	Percentage Distribution in the sample
14. Regular House Health Inspection	a. Carried out b. Not carried out	51.8 48.2
15. Regular House Spraying or fumigation	a. Carried out b. Not carried out	50.8 49.2
16. Programmes for malaria eradication	a. Available b. Not available	53.8 46.2
17. Programmes for mass inoculation	a. Carried out b. Not carried out	73.5 26.5
Social Welfare Environment		
18. Regular Adult Education classes for males	a. Available b. Not available	47.6 52.4
19. Regular Adult Education classes for females	a. Available b. Not available	49.0 51.0
20. Regular Health Education Programmes	a. Carried out b. Not carried out	36.6 63.4
21. Regular cookery or dietary instructions	a. Carried out b. Not carried out	43.2 56.8

TABLE 6 - 7

..CONTINUED

Characteristic	Nature of the characteristic	Percentage Distribution in the sample
22. Regular Embroidery or Artisan Classes	a. Available	37.9
	b. Not available	62.1
23. Regular Visits by Health Visitors	a. Carried out	43.5
	b. Not carried out	56.5
Accessibility to Curative Institutions		
1. Transport Availability to nearest Hospital	a. Available	42.0
	b. Not available	17.7
	c. No transport needed	40.3
2. Transport Time	a. Not applicable	17.7
	b. Not needed	40.3
	c. 1/4 hour	8.0
	d. ½ hour	11.2
	e. 3/4 hour	1.4
	f. 1 hour	7.8
	g. 1 1/4 hour	1.9
	h. 1 ½ hour	2.7
	i. 2 hours	2.5
	j. Over 2 hours	6.5

PLANNING FOR AN OPTIMAL AND EQUITABLE REGIONAL DISTRIBUTION OF CURATIVE HEALTH FACILITIES, WITH SPECIAL REFERENCE TO THE BLUE NILE PROVINCE OF THE SUDAN.

CHAPTER 7

THE ANALYTICAL MODELS

CONTENTS Page

7.0.0 THE ANALYTICAL MODELS

In order to understand why the people in the Blue Nile Region differ in their medical needs and their use of existing curative facilities, two conceptual models are developed. The first model aims at exploring the factors and their relative importance in determining the extent of needs for various types of curative medical care. The second model aims at exploring the factors and their relative importance in determining the extent of demand for various types of curative institutions. An understanding of need factors as well as demand factors will guide towards a more comprehensive planning and distribution of medical care.

The household is proposed as an analytical unit for both the need and the demand models, because it is the basic unit in the community. The collective mode of living in the household is largely responsible for shaping the health condition of its members. The ability of the household as a unit to sustain a healthy standard of living depends on such factors as its income level, health consciousness and other social and material resources which are mutually shared. Moreover, the household as a unit determines whether or not a household member is to receive medical care, and, if care is deemed necessary, whether it should be provided by the household or the formal health services system. The household makes decisions at every stage of a member's illness from diagnosis through treatment and recuperation.[1]

In this chapter the two hypothetical models of need and demand will be discussed in more detail in order to establish a framework for the analysis which will follow.

7.1.0 THE NEED MODEL

The immediate objective of the need model is to explain the household's differences in needs for curative medical care both quantitatively and qualitatively in terms of differences in household characteristics and environmental situations. This will help in determining the causal relationship between the way different people in the region are living and their resultant health condition and accordingly their immediate requirements for more effective curative facilities. Additionally, however, the model can reflect to what extent natural transformation in the community's way of life as well as actions by policy makers in relevant fields can increase or decrease the need for curative care. If future changes can be forecast, a more accurate assessment of future needs for curative medical care can be determined. The importance of need in determining the level of demand has already been stressed. If

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(1) Mabry, J. (1964), "Medicine and the Family". Journal of Marriage and the Family, 26 (May), 160.

Blood, R. and Wolfe, D. (1960). Husbands and Wives: The Dynamics of Married Living. Glencoe: The Free Press.

future needs can be more accurately assessed the level of demand and accordingly the quantity as well as the quality of future curative facilities can be more accurately determined.

7.1.1 The Main Hypothesis

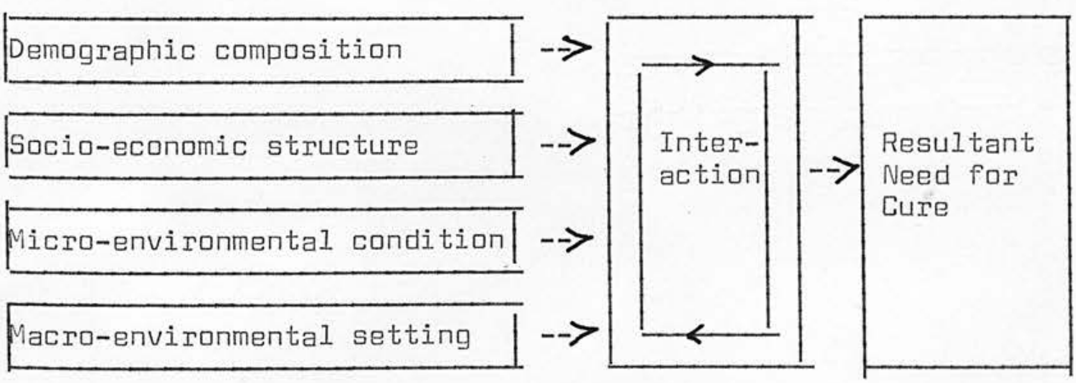
It is hypothesized that the average need of a household for curative care is a function of four main components which describe its total health environment. These components are:-

1. Household demographic composition;
2. Household socio-economic structure;
3. Household micro-environmental condition;
4. Household macro-environmental setting.

It is also hypothesized that the influence of these components is neither uniform on all households nor constant in relation to various qualitative needs. The nature of the relationship between need and the foregoing components can be represented diagrammatically by Figure 7 - 1 below:-

Figure 7 - 1

Diagrammatic Representation of the Need Model



Each component of this model incorporates several sub-components which will be discussed below:-

7.1.2 Household Demographic Composition

This component comprises three main sub-components each of which describes a certain aspect of the composition:-

1. The household size;
2. Its sex composition; and
3. Its age structure.

It is assumed that each sub-component has an independent influence on the household's health condition and accordingly affects the extent of need for various levels of curative care. Each sub-component is measured by one or several indices.

1. Sub-component of Household Size (i)

The household size is measured by a single index which gives the total number of the permanent residents. The household size is reckoned to have an impact on health because of economical as well as psychological reasons. Quite apart from its social merits, shared living in the household has many economical advantages. It helps all the members of the family to maintain a decent standard of living - throughout the different stages of the family life cycle. It is a kind of voluntary scheme of social security for all the household members. Parents can maintain their children when the children are

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(i) The Roman numeral in parentheses following this and subsequent variables refers to the identification number. In Appendix B, the classes and the marginal distribution of each variable is given.

young and unproductive while the grown-up children can support their aging parents when they become unable to work.[1] It is hypothesized that the larger the size of the household is, the greater is the possibility for this mutual support to sustain a high standard of living for all the members. In primitive communities the larger the household, the greater will be the total contribution to the common household budget, and the less the expenditure per individual. Moreover, in such communities an individual belonging to a larger household is psychologically more confident and has less worries and strains in life than an individual belonging to a small household. For these reasons the size of the household is assumed to have some influence on the health condition of the household which affects the extent of its need for various levels of curative care.

2. Sub-component of Household Sex Composition (ii)

The sex composition in the household can also be measured by a single index which gives the percentage of male members. A high percentage of male members implies a low percentage of female members and vice versa. It is assumed that males and females have different disease patterns. Accordingly, the extent of need for various types of curative care in a household will depend on the proportion of the sexes. Generally in the region males lead a more healthy way of life than females. It is hypothesized that the higher the percentage of males in

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(1) Glick, P. and Parker, R. (1965), "New Approaches in Studying the Life Cycle of the Family". Demography, 1, 187.

a household, the less its need for curative care will be.

3. Sub-component of Household Age Structure

Since no single index can be devised to measure a household age structure, it is proposed that this sub-component should be measured by several indices related to various age groups. These indices would give the percentage of members in each of the following age groups:-

a. 1 year and below; (iii)

b. 5 years and below; (iv)

c. 17 years and below; (v)

d. 40 years and above; (vi)

e. 50 years and above. (vii)

It is assumed that the general health level as well as the disease patterns in any of the above age groups is different from the others. A high percentage of members in one age group implies that the household need will be influenced more by the needs of that particular age group.

In addition to these five indices, a sixth index is suggested to describe the influence of women at the child-bearing age on households' needs.(viii) It is assumed that women at the child-bearing age have a pattern of diseases different from that of women at other age groups. This index is measured by the percentage of women at child-bearing age in the female sex.

It is hypothesized that a household with a high percentage of young members will be healthier and accordingly will need less curative care than a household with a high percentage of old members. It is also hypothesized that a household with a high percentage of its females in the child-bearing age will need more curative care than a household with low percentage of such females.

7.1.3 Household Socio-economic Structure

This component comprises three main sub-components each of which describes a certain aspect of the socio-economic structure. The three main sub-components are:-

1. Household Income;
2. Occupation of the Main Earner;
3. Household Level of Awareness.

It is assumed that each of these sub-components has an independent influence on the household's health condition and accordingly affects the extent of its need for various levels of curative care.

1. Sub-component of Household Income (iX)

Income is measured by a single index which gives the total yearly income in pounds. Income is reckoned to be the most important determinant of the living standard in the household. It facilitates the fulfilment of basic human needs for food and shelter. The health condition of the household and accordingly the extent of its need for curative care is assumed to be related to its level of income. It is hypothesized that a household with a high level of income will be healthier and will need less curative care than a household with a low income.

2. Sub-component of the Occupation of the Main Earner(x)

This sub-component describes the occupation of the head of the household. The index defines eight types of occupational classes. These are:-

a. No occupation;

b. Farmers;

c. Farmlabourers;

d. Merchants;

e. Skilled labourers;

f. Unskilled labourers;

g. Clerical employees;

h. Professionals or managerial employees.

It is assumed that the type of occupation the head of the household has, determines the social status of the household and its life style. More skilled occupations are associated with higher social status and a better living condition. This is assumed to lead to a healthier life style and accordingly less need for curative care.

3. Sub-component of Household Level of Awareness

The level of awareness in a household is conceived to be a promoter of a healthier living condition. Household awareness level is measured by four indices each of which is assumed to have an independent contribution to general enlightenment and accordingly to health condition. The four indices are:-

a. The educational level of head;

b. The educational level of mother;

c. The education of the oldest member;

d. The percentage of children at school.

a. Educational Level of Head (xi)

This index gives the level of academic achievements of the head of the household. Six educational levels are defined. These are:-

- No education;
- Nursery or religious education, i.e. "Khalwa" level;
- Primary level;
- Intermediate level;
- Secondary level;
- University or higher institute level.

It is assumed that the higher the level of education of the head, the more enlightened the members of the household will be. The literature generally shows a direct relationship between education and the amount of health services used.(1) This will indirectly reflect more appreciation for maintaining good health. Moreover, education contributes to higher income which raises the living standard and renders a healthier condition possible. Accordingly, it is hypothesized that a higher educational level of head will lead to less need for curative care.

b. Educational Level of Mother (xii)

This index gives the level of academic achievements of the mother or the principal woman in the household. Similar to the previous index, six educational levels are defined. The

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(1) Croog, S. (1961), "Ethnic Origin, Educational Level, and Response to a Health Questionnaire", Op. Cit.

role of the mother in performing the household duties can have a great effect on the life style and the health condition of all the household members. It is hypothesized that a mother with a higher educational level will contribute more to a healthier living condition and accordingly reduce the need of the household members for curative care.

c. Educational Level of the Oldest Member (xiii)

This index gives the academic achievements of the oldest member of the household. This index is devised to reflect the influence of one of the grandparents who usually takes part in decision making in the household even though he or she may not be the active head. By virtue of the age status, the oldest member is assumed to have a more effective role in determining the life style. A household with a highly educated old member is hypothesized to be healthier and to have less need for curative care.

d. Children at School (xiv)

This index gives the percentage of children enrolled in schools. It is assumed that a higher percentage of children at school generally reflects a higher level of awareness about living condition and a better appreciation for maintaining a better health standard. It is hypothesized that a household where a high percentage of its children are at school has less need for curative care.

7.1.4 Household Micro-environmental Condition

This component comprises five sub-components each of which describes a certain aspect of the household's immediate environmental condition, i.e. the housing condition. Good housing environment has often been considered to be a promoter of healthy living conditions. The five housing aspects assumed to have some bearing on health are:-

1. Room occupancy
2. Availability of essential domestic facilities
3. House sanitation
4. House cleanliness
5. Quality of house structure.

1. Sub-component of Room Occupancy (xv)

This sub-component measures the degree of overcrowding in the house. It is measured by a single index which gives the number of persons per habitable room. It is assumed that the higher the number of persons to a room, the more unhealthy the living conditions will become, and the greater the need for curative care will be.

2. Sub-component of Availability of Essential Domestic Facilities

This sub-component describes the extent to which the house facilitates a healthy living environment. It is measured by five indices each of which is related to the availability of one of the following essential facilities:-

a. Water closet or latrine within the house; (xvi)

b. Separate bathroom; (xvii)

c. Separate kitchen; (xviii)

d. Proper food storage space; (xix)

e. Drinking water tap inside the house. (xx)

It is assumed that the lack of any of these facilities in the house is likely to cause some inconvenience and consequently lead to health risks. Accordingly, it is hypothesized that households where any of these facilities are not available would have a higher need for curative care.

3. Sub-component of House Sanitation (xxi)

This sub-component describes the effort towards protection against health hazards within the house. It is measured by a single index which is related to the availability of adequate facilities for draining waste water in the house. It is assumed that the availability of such adequate facilities ensures against insect breeding. Accordingly, it is hypothesized that a household where such measures are provided is healthier and consequently has less need for curative care.

4. Sub-component of House Cleanliness (xxii)

This sub-component describes the degree with which clean house surroundings are being maintained. It is measured by a single index which is related to the presence of loose animals within the house area. It is assumed that the presence of loose animals within the house indicates an unclean environment as a result of which the health of the household members can be affected. Accordingly, it is hypothesized that a household where animals are present is less healthy and consequently has more need for curative care.

5. Sub-component of House Structure (xxiii)

This sub-component describes the safety and durability of the house structure. It is measured by a single index which is related to the type of material with which the house is built. Three types of building materials are considered, i.e. straw-reed, mud or mudbricks, and red bricks or concrete. It is assumed that each of these structural materials has some bearing on health condition. While houses built of mud, mud-bricks, red bricks or concrete are considered to be more safe and durable and can provide for more comfortable living environment, houses built of straw-reed are considered to be unsafe, undurable and can cause many health risks. Accordingly, it is hypothesized that a household where the house structure is more durable, is healthier and consequently has less need for curative care.

7.1.5 Household Macro-environmental Setting

This component comprises five main sub-components each of which describes a certain aspect of the macro-environmental setting for a household. These sub-components are:-

1. The Sub-regional environment;
2. The Residential environment;
3. The Curative environment;
4. The Public and Preventive Health environment;
5. The Social Welfare environment.

It is assumed that each of the five environments contributes independently to the household's health condition and consequently determines the extent of need for the various levels of curative care.

1. Sub-component of the Sub-regional Environment(xxiv)

This sub-component identifies the geographic locality of the household in the region. Three sub-regional areas are defined. These are:-

a. The Northern Blue Nile Area;

b. The Southern Blue Nile Area;

c. The White Nile Area.

Because of physical, socio-economic as well as cultural differences between these three sub-regions, it is assumed that there will be marked differences in the disease patterns. Consequently, there will be marked differences in the extent of need for various levels of curative care. Although the Northern Blue Nile sub-region is economically better off than the other two, the area is predominantly irrigated by an open canalization system which encourages the spread of malaria and waterborne diseases. The Southern Blue Nile sub-region is socially and economically less developed than either the Northern Blue Nile or the White Nile sub-regions. Accordingly, it is hypothesized that households in both the Northern and Southern Blue Nile sub-regions are less healthy than households in the White Nile sub-region and consequently have more need for curative care.

2. Sub-component of the Residential Environment (xxv)

This sub-component identifies the urbanity or rurality of the settlement within which the household resides. Four types of settlements are defined. These are:-

a. Urban settlements, i.e. settlements with over 20,000 population;

b. Semi-urban settlements, i.e. settlements with between 5,000 - 20,000 population, and including all rural administrative centres;

c. Rural farm settlements, i.e. settlements of less than 5,000 population in agricultural areas;

d. Rural non-farm settlements, i.e. settlements of less than 5,000 population in non-agricultural areas.

Because of social and cultural differences between urban and rural settlements, it is assumed that differences in disease patterns exist. Accordingly it is hypothesized that households residing in rural settlements are less healthy than households residing in urban settlements and consequently they have more need for curative care.

3. Sub-component of the Curative Environment

This sub-component describes the level and the type of curative facilities available to households within their settlements. Two main groups of indices are defined for measuring the available facilities. The first group of indices defines the highest level of general curative facilities provided in the settlement. The second group of indices describes the availability of various additional curative facilities. It is assumed that the type of curative facility available to households has a great impact on their health condition and their pattern of diseases.

a. General Curative Facilities (xxvi)

A single index identifies the type of curative facilities provided in the settlement. Six types of facility availability are defined. These are:-

- No curative facilities;
- Dressing station;
- Dispensary;
- Hospital type C;
- Hospital type B;
- Hospital type A.

It is hypothesized that the higher the level of the available curative facilities is, the healthier the households will be and accordingly the less the need for curative care will be.

b. Additional Curative Facilities

Five indices describe the availability of various other facilities which provide some measure of curative care. These indices are related to the availability of the following facilities:-

- Health centre or maternity clinic; (xxvii)
- Special non-general hospital, i.e. for eye diseases or chest diseases, etc.; (xxviii)
- Private clinic, i.e. private medical doctors' offices, etc.; (xxix)
- Drugstore or pharmacy; (xxx)

- Local healer, i.e. "Faki" or osteopath. (xxxi)

It is assumed that the availability of any of these additional curative facilities promotes better health conditions. Accordingly, households residing in settlements where any of these facilities are not available to a certain extent would be less healthy and accordingly will need more curative care.

4. Sub-component of the Public and Preventive Health Environment

This sub-component describes the household environment in relation to the availability of certain public and preventive health measures. Nine indices are defined for measuring the availability of the measures in the settlements. These are:-

- Regular rubbish collection; (xxxii)
- Regular street cleaning; (xxxiii)
- Adequate rainwater disposal system; (xxxiv)
- Regular dirty or stagnant water treatment; (xxxv)
- Piped drinking water system; (xxxvi)
- Regular house health inspection; (xxxvii)
- Regular house spraying or fumigation; (xxxviii)
- Programmes for malaria eradication; (xxxix)
- Programmes for mass inoculation. (xL)

It is assumed that the availability of any of these measures in a settlement help to promote better health condition by reducing the risk of diseases for the resident households. Accordingly, households residing in a settlement where any of these measures are lacking are hypothesized to be less healthy and will consequently need more curative care.

5. Sub-component of the Social Welfare Environment

This sub-component describes the household environment in relation to the availability of certain social welfare programmes. Six indices are defined for measuring the availability of these programmes in the different settlements. These are:-

- Regular adult education classes for males; (xLi)
- Regular adult education classes for females; (xLii)
- Regular health education programmes; (xLiii)
- Regular cookery or dietary instructions; (xLiv)
- Regular embroidery or artisan classes; (xLv)
- Regular visits by health visitors or social workers. (xLvi)

It is assumed that the availability of any of these programmes in a settlement helps to promote health by improving the mode of living. Accordingly, households residing in a settlement where any of these programmes are lacking, are hypothesized to be less healthy and will consequently need more curative care.

7.1.6 Need for Curative Care

The final component of this model is the resultant need for curative care. It has already been pointed out that need can best be measured by an assessment of the frequency of occurrence of different types of diseases. Medical expert opinion is needed for translating the different diseases into precise medical requirements. Some types of diseases can be more readily diagnosed and treated than others. However, the effectiveness of diagnosis and treatment for different disease categories depends on the type of curative institution sought. Because of limitations in manpower, medical equipment, drugs as well as medical knowledge, a lower type of curative institution like a dressing station or dispensary is expected to have a limited degree of effectiveness for some disease categories. On the other hand, a medium type of curative institution like a rural general hospital (hospitals Class B and C) is expected to offer a higher level of effectiveness for those disease categories than either the dressing station or dispensary. Similarly, a higher type of curative institution like a regional hospital (hospital Class A) is expected to offer the highest level of effectiveness possible in the region for these disease categories. Accordingly, it will be assumed that the respective types of curative institution relate the various need inputs to the resulting satisfaction level on a rising scale. In order to determine the extent of qualitative needs, each category of diseases will be given three different weights corresponding to three levels of curative care needed, i.e. primary care, intermediate care and secondary care.

Since primary care is thought to be necessary in all cases of ill-health, each disease category will be given a unit weight. Accordingly, the frequency of occurrence of disease will determine the extent of need for primary care.

Intermediate care is thought to be necessary in cases where primary care fails to attain a high degree of effectiveness and hospitalization is deemed necessary. Accordingly, each disease category will be given a weight corresponding to its hospitalization rate estimated from past trends in the region, i.e. the percentage of cases admitted to hospital in all cases diagnosed as having a particular disease. Hospitalization rates for the different disease categories in the region are given in Table 7 - 1. The table reflects the disease priorities as dictated by the occurrence of diseases, expert medical opinion and limitation of medical resources in the region.

Secondary care is thought to be necessary in cases where intermediate care fails to attain a high degree of effectiveness and further treatment is deemed necessary. Effectiveness of hospital treatment is often judged by the hospital's success in reducing mortality by diseases. Accordingly, in order to determine the extent of need for secondary care, each disease category is given a weight corresponding to its hospital mortality rate. Disease mortality rates in all hospitals in the region are given in Table 7 - 2. The table reflects the disease priorities according to the objective of reducing mortality in the region.

7.1.7 Measuring the Household's Curative Needs

In the need model, the household's need for curative care is conceived to be the product of interaction between the

TABLE 7 - 1

HOSPITALIZATION RATE FOR DISEASE CATEGORIES.

SOURCE: Blue Nile Hospital Record, Health Statistics Division, Ministry of Health, Khartoum.

Disease Category		No. of cases reported in a year	No. of cases admitted to hospital in a year	Hospitalization rate - percentage
Cholera	×	-	-	100.000
Plague	×	-	-	100.000
Smallpox	×	-	-	100.000
Typhus	×	-	-	100.000
Yellow Fever	×	-	-	100.000
Tuberculosis (Pulm.)		913	788	86.309
Influenza		16 865	114	0.676
Other Respiratory Dis.		1 452 048	1 944	0.134
C.S.M.		924	924	100.000
Chicken Pox		6 525	193	2.958
Diphtheria		373	141	37.802
Encephalitis Leth.		15	15	100.000
Measles		9 462	184	1.945
Mumps		17 616	96	0.545
Poliomyelitis Acute		29	20	68.966
Rheumatism Acute		21 102	346	1.640
Whooping Cough		8 227	150	1.823
Dysentry		100 927	752	0.745
Gastro-enteritis		186 908	3 652	1.954

TABLE 7 - 1

..CONTINUED

Disease Category	No. of cases reported in a year	No. of cases admitted to hospital in a year	Hospitalization rate - percentage
Undulant Fever	61	61	100.000
Filariasis	28	28	100.000
Malaria	171 313	2 911	17.460
Leishmaniasis	815	368	45.153
Blackwater Fever ×	-	-	100.000
Onchocerciasis ×	-	-	100.000
Philibotomus Fever ×	-	-	100.000
Relapsing Fever ×	-	-	100.000
Ancylostomiasis	37	000	0.000
Dracontiasis	4 024	197	4.896
Schistosomiasis	42 698	610	1.429
Gonorrhoea	14 881	7	0.047
Soft Sore	220	9	4.091
Syphilis	4 879	18	0.369
Yaws	2	2	100.000
Hydrophobia Human	16	16	100.000
Leprosy	137	137	100.000
Madura Dis.	406	121	29.803
Tetanus	149	76	51.007
Heat Stroke	22	7	31.818
Gynaecological and Dis. of Pregnancy	90 969	5 904	6.490

TABLE 7 - 1

..CONTINUED

Disease Category	No. of cases reported in a year	No. of cases admitted to hospital in a year	Hospitalization rate - percentage
Puerperal Fever	123	123	100.000
Tropical Ulcer	1 133	65	5.737
Diabetes	1 676	159	9.487
Pellagra	21	1	4.762
Scurvy	680	18	2.647
Neoplasms Malignant	113	113	100.000
Trachoma	29 969	611	2.039
All Other Eye Dis.	799 005	149	0.019
Ear Dis.	314 613	78	0.025
Skin Dis.	160 762	744	0.463
Alimentary Dis.	1 405 521	3 913	0.278
Circulatory Dis.	509 673	1 868	0.367
Geneto-Urinary Dis.	275 949	1 029	0.373
Organic Nervous Dis.	46 932	167	0.356
Functional Nervous Dis.	1 182	1 182	100.000
Fever of Uncertain Origin	88 547	962	1.086
Infective Hep.	231	231	100.000
All Other Conditions	124 081	1 234	0.995

Diseases marked with 'x' are not recorded and accordingly their hospitalization rates are estimated from experiences of other areas of the country where such records are available.

TABLE 7 - 2

HOSPITAL MORTALITY RATES FOR DISEASE CATEGORIES.

SOURCE: Blue Nile Hospital Record, Health Statistics Division, Ministry of Health, Khartoum.

Disease Category	No. of cases admitted to hospital in a year	No. of deaths in hospital in a year	Hospital Mortality Rate - percentage
Cholera ×	-	-	2.350
Plague ×	-	-	2.350
Smallpox ×	-	-	2.350
Typhus ×	-	-	2.350
Yellow Fever ×	-	-	2.350
Tuberculosis (Pulm.)	788	73	9.264
Influenza	114	9	7.895
Other Respiratory Dis.	1 944	37	1.903
C.S.M.	924	32	3.463
Chicken Pox	193	2	1.036
Diphtheria	141	9	6.383
Encephalitis Leth.	15	0	0.000
Measles	184	5	2.717
Mumps	96	3	3.125
Poliomyelitis Acute	20	1	5.000
Rheumatism Acute	346	1	0.289
Whooping Cough	150	9	6.000
Dysentry	752	17	2.261
Gastro-enteritis	3 652	323	8.845

TABLE 7 - 2

.. CONTINUED

Disease Category	No. of cases admitted to hospital in a year	No. of deaths in hospital in a year	Hospital Mortality Rate - percentage
Undulant Fever	61	1	1.639
Filariasis	28	0	0.000
Malaria	2 911	71	2.439
Leishmaniasis	368	23	6.250
Blackwater Fever ×	-	-	2.350
Onchocerciasis ×	-	-	2.350
Philibotomus Fever ×	-	-	2.350
Relapsing Fever ×	-	-	2.350
Ancylostomiasis	0	0	0.000
Dracontiasis	197	1	0.508
Schistosomiasis	610	13	2.131
Gonorrhoea	7	0	0.000
Soft Sore	9	0	0.000
Syphilis	18	0	0.000
Yaws	2	0	0.000
Hydrophobia Human	16	2	12.500
Leprosy	137	0	0.000
Madura Dis.	121	9	7.438
Tetanus	76	16	21.053
Heat Stroke	7	0	0.000
Gynaecological and Dis. of Pregnancy	5 904	20	0.339

TABLE 7 - 2

..CONTINUED

Disease Category	No. of cases admitted to hospital in a year	No. of deaths in hospital in a year	Hospital Mortality Rate - percentage
Puerperal Fever	123	3	2.439
Tropical Ulcer	65	14	21.539
Diabetes	159	2	1.258
Pellagra	1	0	0.000
Scurvy	18	1	5.556
Neoplasms Malignant	113	6	5.310
Trachoma	611	0	0.000
All Other Eye Dis.	149	0	0.000
Ear Dis.	78	0	0.000
Skin Dis.	744	52	6.989
Alimentary Dis.	3 913	140	3.578
Circulatory Dis.	1 868	96	5.139
Geneto-Urinary Dis.	1 029	31	3.013
Organic Nervous Dis.	167	4	2.395
Functional Nervous Dis.	1 182	98	8.291
Fever of Uncertain Origin	962	20	2.079
Infective Hep.	231	6	2.597
All Other Conditions	1 234	29	2.350

Diseases marked with 'x' are not recorded and accordingly their hospital mortality rates were taken to be similar for all other conditions, i.e. 2.350%.

various households' characteristics described by the model components. The differences in characteristics are assumed to be the reasons why households in the region differ in their extent of need for various levels of curative care. The regional survey furnishes information about the extent of various diseases experienced by all the members in a household during the period of a year. Different diseases were identified by their symptoms. In order to compare the extent of need for various levels of curative care, it is necessary to have a common denominator for all the households. Different disease categories can be given different weights as already discussed. This will enable the total needs of each household for various levels to be expressed in a single measure. In order to standardize the household unit, the household's total need is then divided by the number of household members and multiplied by a thousand. The reason for multiplying by a thousand is mainly to simplify the calculation and avoid fractions. In this way the household need will be estimated as if each household has a thousand members. Accordingly, the extent of a household's need for the three curative levels of care are estimated as follows:-

1. Need for Primary Curative Care (xLvii)

For this type of care each disease category will be given a weight of one. Thus, a household's need in this case is calculated from the following formula:-

$$Y_1 = \frac{1\,000}{N} (X_1 + X_2 + X_3 + \ldots\ldots X_n)$$

Where $\underline{Y_1}$ represents the extent of need for primary care;

where $\underline{N}$ represents the total number of household members;

where $\underline{X_1, X_2, X_3, \ldots\ldots X_n}$ represent the total frequency of disease categories 1, 2, 3, ... n respectively as extracted from the survey data for each household.

In the region Primary Curative Care can be provided by such curative institutions as dressing stations and dispensaries.

2. <u>Need for Intermediate Curative Care</u> (xLviii)

For this type of care, each disease category will be given a weight corresponding with its hospitalization rate. Thus, a household's need in this case is calculated from the following formula:-

$$Y_2 = \frac{10}{N} (F_1X_1 + F_2X_2 + F_3X_3 + \ldots\ldots F_nX_n)$$

Where $\underline{Y_2}$ represents the extent of need for Intermediate care;

where $\underline{N}$ represents the total number of household members;

where $\underline{X_1, X_2, X_3, \ldots\ldots X_n}$ represent the total frequency in disease categories 1, 2, 3, ... n respectively as extracted from the survey data for each household;

where $\underline{F_1, F_2, F_3, \ldots\ldots F_n}$ represent percentages of hospitalization for disease categories 1, 2, 3, ... n respectively. (Table 7 - 1)

In the region, intermediate curative care can be provided by such curative institutions as a hospital Class B or Class C.

3. Need for Secondary Curative Care (xLix)

For this type of care each disease category will be given a weight corresponding with its hospital mortality rate. Thus, a household's need in this case is calculated from the following formula:-

$$Y_3 = \frac{10}{N} (Z_1 . X_1 + Z_2 . X_2 + Z_3 . X_3 + \ldots\ldots Z_n . X_n)$$

Where $\underline{Y_3}$ represents the extent of need for secondary care;

where $\underline{N}$ represents the total number of household members;

where $\underline{X_1, X_2, X_3, \ldots\ldots X_n}$ represent the total frequency in disease categories 1, 2, 3, ... n respectively as extracted from the survey data for each household;

where $\underline{Z_1, Z_2, Z_3, \ldots\ldots Z_n}$ represent the percentages of hospital mortality for disease categories 1, 2, 3, ... n respectively. (Table 7 - 2)

7.1.8 Differences in Households' Needs

The main aim of the need model is to facilitate a better understanding of the differences among households in their needs for various levels of curative care. The extent of these differences among the sampled households is indicated by Tables 7 - 3, 7 - 4 and 7 - 5. These tables show the distribution of households according to their extent of need during the survey year. Wide ranges in various needs are clearly demonstrated. While about 13% of the households in the sample have each a need of less than 1,000 units per 1,000 population for primary care, 14% of the sampled households have each a need of more than 7,000 units per 1,000 population. A much wider range is reflected in needs for intermediate curative care. While 14% of the households in the sample are shown to have each a need of less than 50 units per 1,000 population for intermediate care, about 12% of the sampled households have each a need of more than 2,000 units per 1,000 population. Some wide ranges are also reflected in needs for secondary curative care. While about 16% of the households in the sample are shown to have each a need for secondary care of less than 25 units, about 17% of the sampled households have each more than 200 units per 1,000 population.

The distribution is positively skewed. Households tend to be clustered at the lower end of the distribution. About 65% of the households have a need for primary care of less than 4,000 units per 1,000 population. 70% of the households have a need for intermediate care of less than 1,000 units per 1,000 population. About 75% of the households have a need for secondary care of less than 150 units. The arithmetic means for primary, intermediate and secondary care are 3,882 units, 938 units and 122 units per 1,000 respectively. The medians for primary, intermediate and secondary care are approximately 3,000 units, 500 units and 100 units respectively.

TABLE 7 - 3

DISTRIBUTION OF HOUSEHOLDS ACCORDING TO EXTENT OF PRIMARY CURATIVE NEED.

Need for Primary Curative Care (per 1000 members)	Per cent of Sampled Households
0 - 999.9	12.9
1000 - 1999.9	21.4
2000 - 2999.9	17.7
3000 - 3999.9	11.8
4000 - 4999.9	10.2
5000 - 5999.9	6.1
6000 - 6999.9	5.9
7000 - 7999.9	2.9
8000 - 9999.9	4.8
10000 or more	6.3
Total per cent	100.0
Total number of households	1466

TABLE 7 - 4

DISTRIBUTION OF HOUSEHOLDS ACCORDING TO EXTENT OF INTERMEDIATE CURATIVE NEED.

Need for Intermediate Curative Care (per 1000 members)	Per cent of Sampled Households
0 - 49.9	14.1
50 - 99.9	3.1
100 - 149.9	5.8
150 - 299.9	14.4
300 - 499.9	12.5
500 - 699.9	11.8
700 - 999.9	8.9
1000 - 1499.9	11.3
1500 - 1999.9	6.2
2000 or more	11.9
Total per cent	100.0
Total Number of households	1466

TABLE 7 - 5

DISTRIBUTION OF HOUSEHOLDS ACCORDING TO EXTENT OF SECONDARY CURATIVE NEED.

Need for Secondary Curative Care (per 1000 members)	Per cent of Sampled Households
0 - 24.9	15.6
25 - 49.9	16.5
50 - 74.9	15.2
75 - 99.9	10.0
100 - 149.9	16.6
150 - 199.9	9.0
200 - 299.9	8.8
300 - 499.9	5.7
500 or more	2.6
Total per cent	100.0
Total number of households	1466

The arithmetic means are higher than the medians because a relatively small proportion of households accounted for a large proportion of the various need levels. However, this distribution does not take into account the differences in sample ratio between urban, semi-urban and rural areas. When these are corrected for the arithmetic means in the region for primary, intermediate and secondary care are 4,559 units, 1,137 units and 145 units respectively. This shows an even greater difference between the means and the medians, an indication that a smaller proportion of the households accounted for a much larger proportion of the needs for all curative care levels. The nature of this distribution indicates the necessity to understand the characteristics of households with high needs and those of low needs to explain the regional distribution. The differences between the arithmetic means for households residing in urban, semi-urban and rural areas as shown in Table 7 - 6, already indicates a marked difference in all types of need. Rural households are shown to have a much higher need for all types of curative care than either urban or semi-urban households. Although the urban households seem to have a much lower need on the average than semi-urban households, yet the differences are not very great.

7.1.9 Summary of Hypotheses Related to the Need Model

The formal hypotheses presented below are derived from the need model. Their common purpose is to explain the differences in the quantity and quality of need for curative

TABLE 7 - 6

HOUSEHOLD MEANS IN URBAN, SEMI-URBAN AND RURAL AREAS FOR THE THREE TYPES OF NEED.

Type of Need	Mean for urban areas	Mean for semi-urban areas	Mean for rural areas
Primary Care	2680	2792	4930
Intermediate Care	589	611	1246
Secondary Care	79	85	158

medical care. They are stated in general terms related only to the main need components. Ideally these hypotheses should be extended to the sub-components and even the different indices within the sub-components. However, because of the complexity of the relationships involved, this study must be considered largely as exploratory. The results, in due time, will lead to further specification of these hypotheses.

<u>Hypothesis 1</u>.

The extent of a household's need for either primary, intermediate or secondary curative care, is a function of the household's demographic composition, its socio-economic structure, its micro-environmental condition and its macro-environmental setting. Each of the four components will make an independent contribution to the understanding of differences in the three levels of need.

<u>Hypothesis II</u>.

In each level of need, the explanatory components of the model will vary in their contribution to the total explanation. The macro-environmental component will be the most important of all the components in each case, because it represents factors directly connected with health improvements on the community level.

<u>Hypothesis III</u>.

The relative contribution of each component will vary according to the type of need considered, because the disease priority is different in each case.

Hypothesis IV.

The overall success of the model in explaining needs will vary from one type of need to the other:-

1. It will best explain need for primary care, because this by definition incorporates all needs.
2. It will have less success in the case of need for intermediate and secondary care, because by definition each of these implies partial need.

7.2.0 THE DEMAND MODEL

The immediate objective of the demand model is to explain the differences between households in their demands for curative medical care. In the model demand is conceived as a form of human behaviour which is motivated by need and which only becomes effective if certain situational conditions are met. The extent and the quality of need as well as the extent of the situational conditions are therefore hypothesized to determine the extent of demand for the different types of curative institutions in the region. Inversely, the model can reflect, given the extent of need for various levels of curative care, to what extent the households' characteristics and the existing distributional pattern of the curative facilities in the region can increase or decrease the level of demand for the appropriate curative facilities. If future changes in these factors can be forecast a more accurate assessment of future demands for the various types of curative facilities can be estimated.

In view of the scarcity of the medical care resources it should be pointed out that not all the demands made are justifiable. Some demands need to be increased while others need to be decreased in order that demand approximates to need. A more equitable distribution will be attained in the region when need explains almost all the variations in demand. Accordingly, an ideal curative care distribution will be achieved if all demands made are explained by need alone.

7.2.1 The Main Hypothesis

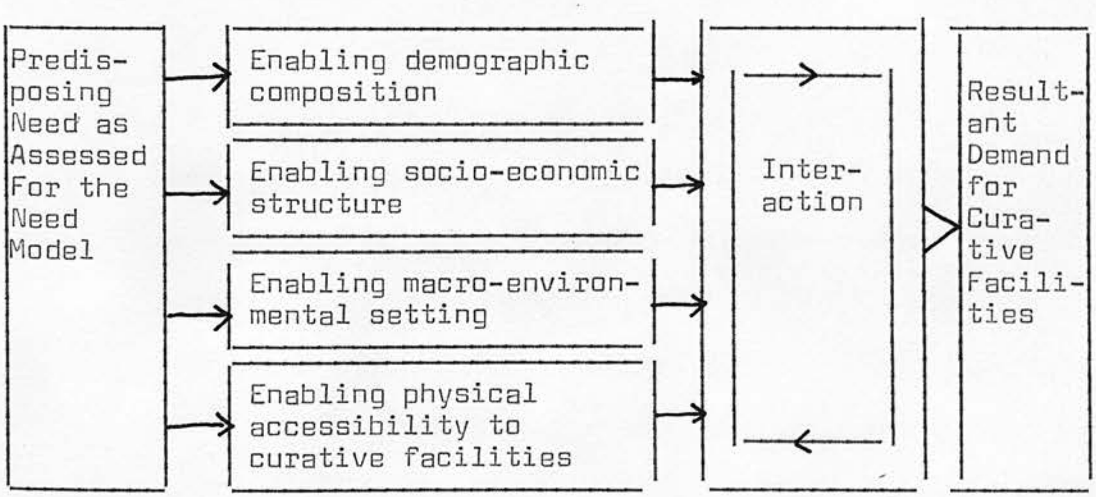
It is hypothesized that the extent of a household's demand for curative facilities is a function of a predisposing need component and enabling situational components. These enabling situational components include:-

1. Household demographic composition;
2. Household socio-economic structure;
3. Household macro-environmental setting;
4. Household physical accessibility to the different curative facilities.

It is also hypothesized that the influence of both the predisposing need component and the enabling situational component, is neither uniform on all the households, nor constant in relation to various types of curative facilities. The relationship between these factors and the resulting demand can be diagrammatically represented by Figure 7 - 2 below:-

Figure 7 - 2

Diagrammatic Representation of Demand Model



These components are discussed below:-

7.2.2 Predisposing Household Need

Need is conceived to be the main factor in motivating demand for curative facilities. For this model three types of needs are defined, i.e. need for primary, intermediate and secondary care. The measures for each of these three needs are similar to those defined in the need model. It is hypothesized that the greater a household need for any type of curative care is, the greater the extent of demand for it will be. A high demand for a particular type of curative facility, when the need for it is low, is considered to be an over-demand and accordingly non-optimal. On the other hand, a low demand for a particular type of curative facility when the need for it is high is considered to be an under-demand and accordingly also non-optimal. The influence of the enabling situational factors are thought to be the reasons why such non-optimal situations of demand can arise.

7.2.3 Enabling Demographic Composition

Irrespective of the extent of need, three aspects of the household's demographic composition are assumed to influence the extent of demand for curative facilities. These are:-

1. Household size;
2. Household sex composition;
3. Household age structure.

The indices for these three aspects have already been discussed under the need model. But their influence on demand is thought to be independent of their influence on need.

A small household size is assumed to enable demand to take place. Larger households are hypothesized to have less average demand for curative facilities than smaller ones. Sick members in large sized households can be looked after by other members more readily than their counterparts in small sized households and accordingly their demands of the health services will be less.

The sex composition of the household is also assumed to have an enabling effect. A household with a high percentage of males is hypothesized to make more average demands than a household with a high percentage of females. In the region, men are more mobile and can make trips to curative institutions more frequently than women, especially if the facility demanded involves some travel. Traditionally, women are housebound.

The age structure of the household is assumed to have an impact on the extent of demand. A household with a high percentage of its members in the lower age groups is hypothesized to make more demands for curative facilities than a household with a high percentage of its members in the upper age groups. When a younger member falls ill, the household members are usually more anxious to secure medical help for him than for an older member falling ill. Aged people tend to have mistrust of the effectiveness of modern medicine and therefore have less demand for it.

7.2.4 Enabling Socio-economic Structure

Quite apart from its influence on need, the socio-economic structure of the household is assumed to have an impact on the extent of demand for curative facilities, especially if medical facilities are not provided free of charge. However, when no charges are imposed, the effect of the economic factors is expected to be negligible. In this model the socio-economic structure is represented by three sub-components:-

1. Household income;
2. Occupation of the main earner;
3. Household level of awareness.

The indices for measuring these sub-components have already been dealt with in the need model.

Household income is hypothesized to have two contradicting influences on demand for curative facilities depending on the location of the facilities demanded. High income households residing in settlements where certain types of curative facilities are available tend to demand less of the public curative facilities because they can afford to pay for private facilities of a higher standard. On the other hand, high income households residing in settlements where the certain types of curative facilities are not available tend to demand more of such facilities than low income households because they can afford to pay transport costs to secure better treatment elsewhere.

Occupation of the main earner is assumed to have both enabling and constraining effects because it reflects the social status of the household. Households of high social status attach greater value to their health and tend to demand more curative facilities than low status households. On the other hand, high status households tend to use more of the private medical facilities and accordingly less of the public medical facilities.

The level of awareness is represented by four indicators, i.e. educational level of the head of the household, the educational level of the mother, the educational level of the oldest member, and the percentage of children at school. The indices measuring each of these have been discussed in the need model. Households where educational levels or the percentages of children at school are high, are assumed to be more aware of their health condition and will tend to demand more curative facilities than households where the educational levels or the percentage of children at school are low. The former households are said to have a lower perceptual threshold of conditions of illness requiring treatment, while the latter households have a higher perceptual threshold.

7.2.5 Enabling Macro-environmental Setting

Only certain aspects of the macro-environment are assumed to influence demand for curative facilities. These are:-

1. The Sub-regional environment;
2. The Residential environment;
3. The Curative environment;
4. The Social Welfare environment.

The distribution of health care facilities varies considerably from one section of the region to another. These variations would have some influence on people's attitudes towards the medical care system and its effectiveness and would accordingly influence the demand patterns. Consequently, it is hypothesized that households residing in different sub-regions would make different demands for the various types of curative facilities.

Similarly, the urban-rural differences in health care facilities are assumed to influence the attitudes. Consequently, it is hypothesized that households residing in rural areas would have different demand patterns from those residing in urban or semi-urban areas.

The curative environment is assumed to have some influence on the patterns of demand. The type of curative institution available to the household tends to be used more than others which are not available. Households residing in settlements where only dressing stations or dispensaries are provided would be likely to make more demands for primary care and less demands for intermediate or secondary care and vice versa. However, more demands are made for the nearest type of hospital(L) than for the one furthest away, irrespective of the distance or the quality of care attainable.

The availability of alternative means for treatment, i.e. maternity clinic, a speciality hospital, drug store, private practicing doctor or local healer is also assumed to reduce the extent of demand for the formal health care facilities irrespective of their impact on the level of need.

Two aspects of the social welfare environment are assumed to influence demand. Health education helps people to understand more about their health conditions and when to seek the appropriate type of curative facility. Social workers or health visitors making regular contact with people can also guide them to have their health complaints seen to. The availability of such social welfare facilities for households is assumed to encourage them to make more demands for various types of curative facilities when needed.

7.2.6 Enabling Physical Accessibility

Irrespective of the extent of need or the differences of other situational factors already mentioned, accessibility is assumed to have some impact on the extent of demand for various types of curative facilities. In this model accessibility is represented by three sub-components:-

1. The distance between the household's residence and the location of the curative institution;
2. The availability of transport facilities between residence and the facility location;
3. The average journey time of public transport when available.

1. The Sub-component of Distance

Distance is given in kilometres along the shortest route between the settlement of residence and the settlement where the curative institution is located. For each household three indices of distance are defined:-

a. Distance to nearest primary care institution; (Li)

b. Distance to nearest intermediate care institution; (Lii)

c. Distance to nearest secondary care institution. (Liii)

In relation to primary care, it is hypothesized that the smaller the value of the first index is, the greater the level of demand will be. Also, the larger the value of the second or third index is, the greater the level of demand will be.

In relation to intermediate care, it is hypothesized that the smaller the value of the second index is, the greater the level of demand will be. Also, the larger the value of the first or third index is, the greater the level of demand will be.

In relation to secondary care, it is hypothesized that the smaller the value of the third index is, the greater the level of demand will be. Also, the larger the value of the first or second index is, the greater the level of demand will be.

<u>2. The Sub-component of Transport Availability</u> (Liv)

The transport situation is indicated by an index which describes whether regular transport to the nearest hospital is available or not. It is hypothesized that households residing in settlements where regular transport to the nearest hospital is available, will make more demands for that type of curative institution, and accordingly will make less demands for other types of curative facilities.

3. The Sub-component of the Journey Time (Lv)

The journey time is given in minutes between departure and arrival of a public transport bus from the settlement of residence to the settlement where the nearest hospital is located. It is assumed that people will be less encouraged to make visits to a hospital when the journey time is great. Therefore, it is hypothesized that the shorter the journey time is, the greater the level of demand for that type of institution will be, and, accordingly, the lesser the level of demand for other types will be.

7.2.7 Demand for Curative Facilities

The final component of this model is the resultant demand for curative facilities. The basic unit of demand is the visit to a curative institution. Since there are three distinct types of curative institutions, i.e. primary care, intermediate care and secondary care institutions, the extent of demand a household makes to each type can be determined from the number of visits made by the household members during the survey year. However, in order to standardize the measure for all the households, the total number of visits in each household to each type of institution is divided by the number of household members and multiplied by 1 000. This would give the extent of demand in each household as though the household has a thousand members. With such a qualitative measure it will be possible to compare the extent of demand for each level of care separately. However, it will be difficult to sum up the various levels of demand in order to obtain a single measure of overall demand, because of differences of care. A visit to a dressing station or a dispensary will not give the consumer the same chances of diagnosis and effective treatment as a visit to a Class A hospital. In order to facilitate the aggregation of different qualities of care a cost equivalent criterion is suggested for weighing the different visits. The monetary unit can facilitate summation. Accordingly, visits to a primary care institution will be assumed to provide the consumer with a quality of care corresponding to what it costs the government to provide it. Similarly, visits to intermediate care and secondary care institutions will be assumed to provide the consumer with qualities of care corresponding to their respective costs. The underlying assumption in this case is that the quality of medical care provided is a function of the money spent on it. The validity of this assumption depends on the achievement of efficiency in the functioning of the various curative institutions in the region. If all curative institutions in the region are working at their optimum level, the quality of medical care delivered will be very highly sensitive to cost differentials and the qualities will accordingly be a direct function of cost. The cost equivalent index can therefore make it possible to sum up diverse services and thereby facilitate more accurate comparison of the overall demands made by households in the region. Table 7 - 7 gives the cost equivalent indices for primary care, intermediate care and secondary care institutions.

7.2.8 Measuring the Household's Demands for Curative Care

In the demand model, the household's demands for curative facilities are conceived to be the product of interaction between the household's predisposing need and the various enabling situation components. The differences in the extent of need as well as the differences in the enabling characteristics are assumed to be the reasons why households in the region differ in their demands for curative facilities. The regional survey furnishes information about the total number of visits made to the different types of curative institutions by all members of each sampled household in a year. The household's demand for various types of curative care is estimated as follows:-

1. Demand for Primary Curative Care

This type of demand is calculated for each household from the following formula:-

$$Y_1 = \frac{1\,000 \cdot X_1}{N}$$

Where $\underline{Y_1}$ represents the extent of demand for primary care;

Where $\underline{N}$ represents the total number of household members;

Where $\underline{X_1}$ represents the total number of visits made by all the household members to primary curative care institutions - dispensaries or dressing stations - in a year.

TABLE 7 - 7

EXPENDITURE, NUMBER OF VISITS AND COST EQUIVALENT FOR CURATIVE INSTITUTIONS IN THE BLUE NILE REGION. (1)

(FIGURES ARE COLLECTED FOR 1970 - 71.)

Institution	Total yearly expenditure in LS	Total No. of visits in a year	Cost equivalent
Primary Care			
Dispensaries and Dressing Stations	474 565.770	3 348 402	0.142
Average Cost Equivalent			0.142
Intermediate Care			
Hospitals Class B			
- Kosti	111 286.000	259 589	0.428
- Rufaa	66 793.000	100 000	0.668
- Dueim	60 088.000	83 380	0.721
- Singa	100 058.000	215 148	0.465
- Sennar	99 257.000	548 551	0.181
- Roseires	51 074.000	201 389	0.254
Hospitals Class C			
- Managil	41 046.000	146 160	0.281
- 24. Qurashi	32 576.000	119 568	0.275
- El Geteina	37 971.000	45 124	0.841
- El Huda	31 083.000	71 250	0.436
- El Kawa	26 193.000	35 257	0.743
- El Damazin	30 301.000	71 308	0.369
- El Dinder	24 765.000	180 623	0.137
- El Kurmuk	31 719.000	39 618	0.801
- El Gezira Aba	25 564.000	30 830	0.829
- El Hosh	15 198.000	87 492	0.176
- El Medina	8 995.000	40 166	0.223
Average Cost Equivalent			0.459

TABLE 7 - 7

..CONTINUED

Institution	Total yearly expenditure in LS	Total No. of visits in a year	Cost equivalent
Secondary Care			
Hospitals Class A			
- Wad Medani	416 374.000	389 929	1.068
- Abu Ushar	80 525.000	65 068	1.084
Average Cost Equivalent			1.076

(1) Other Hospitals are not included because of inadequate information on them (i.e. Hasaheisa, Tabat, Genéid and Messalamiya).

2. Demand for Intermediate Curative Care

This type of demand is calculated for each household from the following formula:-

$$Y_2 = \frac{1\,000\,X_2}{N}$$

Where $\underline{Y_2}$ represents the extent of demand for intermediate care;

where $\underline{N}$ represents the total number of household members;

where $\underline{X_2}$ represents the total number of visits made by all the household members to intermediate curative care institutions - Class B or C hospitals - in a year.

3. Demand for Secondary Curative Care

This type of demand is calculated for each household from the following formula:-

$$Y_3 = \frac{1\,000\,X_3}{N}$$

Where $\underline{Y_3}$ represents the extent of demand for secondary care;

where $\underline{N}$ represents the total number of household members;

where $\underline{X_3}$ represents the total number of visits made by all the household members to secondary curative care institutions - Class A hospital - in a year.

4. Demand for Total Curative Care

Demand for total curative care combines the three types of demands mentioned earlier after weighing each type with its corresponding cost-equivalent index as derived from Table 7 - 7. Accordingly, the total demand for curative care is calculated for each household from the following formula:-

$$Y_T = \frac{1\,000}{N} \; (0.142\ X_1 + 0.459\ X_2 + 1.076\ X_3)$$

Where $\underline{Y_T}$ represents the extent of total demand for curative care;

where $\underline{N}$ represents the total number of household members;

where $\underline{X_1, X_2, X_3}$ represent the annual number of visits made by all the household members to primary care, intermediate care and secondary care institutions respectively;

where <u>0.142, 0.459, 1.076</u> represent constants equal to the average cost-equivalents for primary, intermediate and secondary care respectively. (See Table 7 - 7)

7.2.9 Differences in Households' Demands

The main aim of the demand model is to facilitate a better understanding of the differences among households in their demands for curative care. The extent of these differences among the sampled households is indicated by Tables 7 - 8, 7 - 9, 7 - 10 and 7 - 11. The tables show the distribution of households according to the extent of demand for the curative facilities in the region during the survey year. Wide ranges are demonstrated. While about 43% of the households in the sample have not made any demands for the primary care institutions at all, 57% of the households made varying demands

TABLE 7 - 8

DISTRIBUTION OF HOUSEHOLDS ACCORDING TO EXTENT OF DEMAND FOR PRIMARY CARE.

Demand for Primary Care (per 1000 members)	Per cent of Sampled Households
00 -	42.9
1 - 999.9	15.7
1000 - 1999.9	11.2
2000 - 2999.9	7.1
3000 - 3999.9	6.3
4000 - 4999.9	4.0
5000 - 5999.9	2.7
6000 - 6999.9	2.3
7000 - 7999.9	1.8
8000 - 8999.9	1.2
9000 - 9999.9	1.3
10000 and over	3.5
Total per cent	100.0
Total number of households	1466

TABLE 7 - 9

DISTRIBUTION OF HOUSEHOLDS ACCORDING TO EXTENT OF DEMAND FOR INTERMEDIATE CARE.

Demand for Intermediate Care (per 1000 members)	Per cent of Sampled Households
00 -	57.8
1 - 499.9	14.6
500 - 999.9	7.7
1000 - 1499.9	5.0
1500 - 1999.9	2.8
2000 - 2499.9	2.5
2500 - 2999.9	1.6
3000 - 3499.9	1.5
3500 - 3999.9	1.2
4000 - 4499.9	1.1
4500 - 4999.9	0.6
5000 and over	3.6
Total per cent	100.0
Total number of households	1466

TABLE 7 - 10

DISTRIBUTION OF HOUSEHOLDS ACCORDING TO EXTENT OF DEMAND FOR SECONDARY CARE.

Demand for Secondary Care (per 1000 members)	Per cent of Sampled Households
00 -	68.6
1 - 499.9	12.5
500 - 999.9	6.3
1000 - 1499.9	4.2
1500 - 1999.9	2.3
2000 - 2499.9	1.8
2500 - 2999.9	1.0
3000 - 3499.9	0.8
3500 - 3999.9	0.5
4000 - 4499.9	0.6
4500 - 4999.9	0.2
5000 and over	1.2
Total per cent	100.0
Total number of households	1466

TABLE 7 - 11

DISTRIBUTION OF HOUSEHOLDS ACCORDING TO EXTENT OF TOTAL DEMAND FOR CURATIVE CARE.

Total Demand for Curative Care	Per cent of Sampled Households
00 -	11.9
1 - 499.9	36.3
500 - 999.9	18.1
1000 - 1499.9	11.4
1500 - 1999.9	7.8
2000 - 2499.9	4.4
2500 - 2999.9	2.9
3000 - 3499.9	1.9
3500 - 3999.9	1.3
4000 - 4499.9	0.9
4500 - 4999.9	0.7
5000 and over	2.4
Total per cent	100.0
Total number of households	1466

reaching up to over 10,000 units per 1,000 population. In the case of demands for both intermediate and secondary care, while about 70% of all the households have either made no demands at all or less than 500 units per 1,000 population, about 30% have made varying demands reaching up to 5,000 units or more per 1,000 population. When considering total demand for curative facilities the same variations are reflected. About 12% of the households are shown to have made no demands at all, while about 12% have made 2,500 units each or more per 1,000 population. In all types of demand the distribution tends to be clustered at the lower end of the distribution with the median under 500 units for each of the three types of demand and 539 for overall demand. Yet the arithmetic means show much higher values, i.e. 1,891 units for primary care, 734 units for intermediate care and 379 units for secondary care and 1,015 units for total curative care demands. This demonstrates that a relatively small proportion of the sampled households accounted for a large proportion of the various demands. This picture, however, does not reflect the regional variations perfectly because of variations in the sample ratio between urban, semi-urban and rural areas. Adjusting for these variations the arithmetic means for the region will be somewhat higher in the case of primary care demand, i.e. 2,605, but somewhat lower in the case of intermediate care, secondary care and total demands, i.e. 610 units, 267 units and 937 units respectively.

An examination of Table 7 - 12 shows a wide range of variations in the arithmetic means for households residing in

TABLE 7 - 12

HOUSEHOLD MEANS IN URBAN, SEMI-URBAN AND RURAL AREAS FOR THE VARIOUS DEMANDS (PER 1000 PERSONS).

Type of Demand	Mean Urban	Mean Semi-urban	Mean Rural
Primary Care	468	1065	2961
Intermediate Care	675	1511	481
Secondary Care	816	87	255
Over-all Care	1254	938	915

urban, semi-urban and rural areas. Urban households, as well as making the highest demands for secondary care, make the highest demands for total care and comparatively low demands for either intermediate or primary care. Semi-urban households make the highest demands for intermediate care and comparatively high demand also for primary as well as total care, but the least demand for secondary care. Rural households make the highest demands for primary care and comparatively less of the other types of curative care. If these patterns of demands are compared with the patterns of needs shown in Table 7 - 6, the equity of the distribution of curative facilities appears questionable. More understanding is needed for the characteristics that determine need and those that influence demand if a more rational distribution of curative facilities and more optimal future planning is to be pursued.

7.2.10 Summary of Hypotheses Related to the Demand Model

The formal hypotheses presented below are derived from the demand model. They are intended to explain the differences in the quantity and quality of demands made by households for curative facilities in the region. They are stated here only at the general level in terms of components. They are not extended to the sub-component levels because of the complexity of the relationships involved. However, since this study is largely exploratory, the findings will lead to further specification of these hypotheses.

Hypothesis I.

The extent of total demand a household makes for curative care facilities in a region will be a function of the predisposing need components and the enabling demographic, socio-economic, macro-environmental and physical accessibility characteristics. Each of the five components will make an independent contribution to the understanding of the differences in demand for curative facilities.

Hypothesis II.

The explanatory components of the model will vary in their contribution to the explanation of total demand. Need will be more important than any of the other enabling components because it is the main reason for demanding curative care.

Hypothesis III.

The relative contribution of each component will vary according to the type of demand:-

1. The relative contribution of the predisposing component will be greatest in the case of demand for primary care institutions because these are most abundant and a household has least discretion in choosing alternative institutions.
2. The relative contribution of the enabling components will be greatest in the case of demand for intermediate and secondary care institutions because these are fewer in number and there is a certain amount of household discretion involved in demanding each of them.

3. The relative contribution of the enabling physical accessibility component in particular will be greatest in the case of demand for secondary care institutions because these are least available in the region and most inaccessible to the bulk of the regional population.
4. The relative contribution of the socio-economic component will be least in all types of demand because all health services in the region are free of charge.

Hypothesis IV.

The overall success of the model in explaining differences in demand will vary slightly from one type of demand to another:-

1. It will best explain demand for primary care institutions because differences in this type of demand will be explained primarily by the predisposing need component.
2. It will have less success in explaining demand for intermediate and secondary care institutions because differences in these will be explained primarily by the discretionary enabling components.

CHAPTER 8

ANALYSIS OF NEED

CONTENTS Page

8.0.0 ANALYSIS OF NEED

This chapter is an analysis of differences in the extent of households' needs for various types of curative care. It considers these differences within the framework of the need model developed in Chapter 7. Specifically, the four hypotheses related to the need model are investigated here:-

Hypothesis I.

The extent of a household's need for either primary, intermediate or secondary curative care, is a function of the household's demographic composition, its socio-economic structure, its micro-environmental condition and its macro-environmental setting. Each of the four components will make an independent contribution to the understanding of the differences in the three levels of need.

Hypothesis II.

In each level of need, the explanatory components of the model will vary in their contribution to the total explanation. The macro-environmental component will be the most important of all the components, because it represents factors directly connected with health improvements on the community level.

Hypothesis III.

The relative contribution of each component will vary according to the type of need considered, because the disease priority is different in each case.

Hypothesis IV.

The overall success of the model in explaining needs will vary from one type of need to the other:-

1. It will best explain need for primary care, because this by definition incorporates all needs.
2. It will have less success in the case of need for intermediate and secondary care, because by definition each of these implies only partial need.

Separate analyses of need for primary, intermediate and secondary curative care are presented in this chapter. These needs are the major components of the total need for curative medical care for each household in the region.

The analysis of each type will first examine the simple correlations between need and the variables representing each component and sub-component of the model. These correlations show the magnitude and direction of the basic relationships. Secondly, an analysis of variance designed to provide evidence regarding more detailed relationships and causal effects, will be conducted.

8.1.0 NEED FOR PRIMARY CARE

A household's need for primary care refers to the extent of a household's requirements for an initial contact with the curative system in order to confirm the viability of its health complaints on medical grounds and prescribe the possible effective treatment or determine the course of action to be followed towards that end. It has already been proposed that the institutions which can perform such a task in the Blue

Nile region are dispensaries and dressing stations.

8.1.1 Correlation Analysis of Need for Primary Care

I. Method

The correlations reveal to what extent the various sub-components in the model are associated with need for primary care. The magnitude of the correlation coefficient varies from -1 to +1. The higher the correlation coefficient is, the greater the association of the variable with the need for primary care will be. A positive correlation coefficient implies a direct relationship, while a negative one implies an inverse relationship.

II. Findings

Table 8 - 1 shows that a significant relationship existed between need for primary care and almost every sub-component of the model. The macro-environmental component, as expected, was most closely associated with need. Households which resided in settlements where the highest level of curative facilities had been provided tended to have the least need for primary care. Moreover, households which resided in settlements where curative facilities, public health and preventive medical care measures or social welfare programmes had been provided tended to have less need for primary curative care than households residing in settlements where such facilities had not been provided. The best predictors of need for primary care were shown to be the type of general curative facility available, availability of mass inoculation programmes,

TABLE 8 - 1

CORRELATION OF EXPLANATORY VARIABLES WITH NEED FOR PRIMARY CARE.

Independent Variable			Correlation Coefficient
Component	Identification No.	Sub-components	
Demographic composition	i	Household size	-.226
	ii	Household sex composition (% males)	-.079
		Household age structure:-	
	iii	% 1 year and below	-.007 ×
	iv	% 5 years and below	-.048
	v	% 17 years and below	-.201
	vi	% 40 years and above	.113
	vii	% 50 years and above	.009 ×
	viii	% females at child-bearing age	.138
Socio-economic structure	ix	Household income	-.191
	x	Occupation of Head	-.136
		Household level of awareness:-	
	xi	Educational level of Head	-.104
	xii	Educational level of Mother	-.052
	xiii	Educational level of Oldest	.065
	xiv	% children at school	-.191
Micro-environmental condition	xv	Room occupancy	.115
		Household facilities:-	
	xvi	W.C. or latrine	-.222
	xvii	Bathroom	-.193
	xviii	Kitchen	-.163
	xix	Food storage	-.152
	xx	Water tap inside	-.245
	xxi	House sanitation (proper drainage)	-.187
	xxii	House cleanliness (absence of animals)	.126
	xxiii	Quality of house structure (Construction)	-.176
Macro-environmental setting	xxiv	Sub-region (Ranked)	-.128
	xxv	Residence (Ranked)	-.291
		Curative environment:-	
	xxvi	General Curative Facilities	-.314
	xxvii	Health Centre or Maternity Clinic	-.259
	xxviii	Special Non-General Hospital	-.135
	xxix	Private Clinic	-.282

TABLE 8 - 1

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Independent Variable			Correlation Coefficient
Component	Identification No.	Sub-components	
Macro-environmental setting	xxx	Drugstore or Pharmacy	-.204
	xxxi	Local Healer (Osteopath)	-.207
		Public and Preventive Health Environment:-	
	xxxii	Regular Rubbish Collection	-.284
	xxxiii	Regular Street Cleaning	-.307
	xxxiv	Adequate Rain Water Disposal	-.228
	xxxv	Regular Stagnant Water Treatment	-.218
	xxxvi	Piped Drinking Water System	-.242
	xxxvii	Regular House Health Inspection	-.304
	xxxviii	Regular House Spraying or Fumigation	-.281
	xxxix	Programmes for Malaria Eradication	-.208
	xL	Programmes for Mass Inoculation	-.308
		Social Welfare Environment:-	
	xLi	Regular Adult Education - Males	-.234
	xLii	Regular Adult Education - Females	-.230
	xLiii	Regular Health Education	-.197
	xLiv	Regular Cookery or Dietary Instructions	-.208
	xLv	Regular Embroidery or Artisan Classes	-.200
	xLvi	Regular Visits by Health Visitors	-.268

x Not significant at the .01 level.

- Negative association.

regular street cleaning and regular health inspection of the house. The other curative, preventive and public health measures were nearly as important predictors as those mentioned. These facilities are highly intercorrelated. Settlements that have some curative facilities are more likely to have some public and preventive health measures as well as some social welfare facilities.

The micro-environmental component followed the macro-environmental component in magnitude of correlation with need for primary care. Households which had tapped drinking water within the house tended to have the lowest needs for primary care. Households which lacked a water closet, a latrine, a bathroom, a kitchen or a proper food storage tended to have higher needs for primary care, than those which had these facilities. Households which lacked proper sanitation and cleanliness within the house as well as those where there was high over-crowding also tended to have higher needs for primary care than those with healthier living environments within the house.

The demographic composition component was next to the micro-environmental component in magnitude of correlation with need for primary care. The household size was the best predictor of need among the rest of the sub-components. Generally, large households, those with high percentages of members in the age group 17 years or below, those with low percentages of members 40 years or above, and those with low percentages of females in the child-bearing age, tended to have the lowest need for primary curative care. The sex composition seemed to play a comparatively small role with regard to need. However, households with high percentage of males still tended to have lower needs than those where percentages of females were high. Generally, age groups 5 years and below and 50 years and above did not reflect any significant association with need.

The socio-economic component also showed some significant relationship with need; but the magnitude of these correlations tended to be lower than those for the other sub-components. The educational level of the mother and that of the oldest member, in particular, showed a rather less significant association with need. Household income, the percentage of children at school and the occupational status of the main earner showed some recognizable association with need. Generally, households with high income and high level of awareness as indicated by the high percentage of children at school, tended to have low need for primary care. It should be noted that most of these characteristics are also highly intercorrelated.

In sum, Table 8 - 1 shows that households probably differ most in their needs for primary curative care because of varying macro-environmental situations created by variations in the provision of curative as well as preventive, public health and social welfare measures. In addition, the demographic composition as indicated by the size of the house, the age structure as well as the sex composition played an important role. The micro-environmental condition as indicated by the housing condition also had an important influence on the extent of need for primary care. The socio-economic characteristics even although they were comparatively less important for determination of need for primary care than the other factors, were still valid considerations to be borne in mind when assessing the extent of need for primary curative care.

8.1.2 A.I.D. Analysis of Need for Primary Care

I. Method

The analysis of household needs for primary curative care up to this point relied on simple correlation coefficients. While these coefficients provided an overall picture of the relationship between each sub-component and need, they did not take into consideration the interrelationships of the different variables. This consideration is of particular importance since the causal effects of the different variables cannot be estimated. Moreover, such raw correlations would only be valid predictors if all the relationships were known to be monotonic (i.e. do not change direction), and additive (i.e. applicable to all the households in the sample). Such assumptions of linearity and additivity could in fact lead to some important relationships being overlooked and not adequately represented.

A computer programme developed by Sonquist and Morgan called the Automatic Interaction Detection-version 2 (AID) was used to apply the model.(1)

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(1) Sonquist, J. and Morgan, J.N. (1964). The Detection of Interaction Effects, Ann Arbor: University of Michigan, Survey Research Centre for Social Research, Monograph 35.

Essentially, the A.I.D. is a form of "step-wise regression programme", where the independent variables (predictors) need not be only quantitative. They can either be quantitative or qualitative (i.e. type of sub-region, type of residence, type of occupation, etc.). Taking need as the dependent variable, the analysis employs a non-symmetrical branching process based on variance analysis techniques to sub-divide the sample into a series of sub-groups which maximize one's ability to predict values of the dependent variable. Both linearity and additivity assumptions inherent in conventional multiple regression techniques are not required.(1)

The programme was developed for social survey analysis in which measures for a set of predictors and a dependent variable have been obtained. The predictors can either be classificatory variables or more precise scales of measurements. The dependent variable can be continuous, an equal interval scale or a dichotomy.

The programme operates by finding that dichotomy based on any predictor which gives the lowest within group sum of squares (i.e. unexplained variance) for the dependent variable. Essentially, this is the dichotomization which "accounts for" more of the variance of the dependent variable than any other dichotomization based on grouping the categories of a single predictor into two groups. The programme seeks to answer the question, "what single predictor will give a maximum

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(1) A Detailed Description of the A.I.D. Algorithm is given in Appendix B.

improvement in ability to predict values of the dependent variable at any stage in the analysis.[1]

The total sample is considered the first group at the start. Having made the first dichotomy, the A.I.D. programme then takes the "eligible" group with the largest within group sum of squared deviations for the dependent variable and splits it in a similar manner. A group is eligible for splitting if it has at least a specified number of observations (i.e. households), and a within group sum of squared deviations at least as great as a specified proportion of the total squared deviations (i.e. 0.1, 0.01, .001, etc.), Splits will be made only if the within group sum of squared deviations is reduced by

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(1) Certain terms which will be used throughout this analysis are:-

i - Total Variation, or total sum of squares (TSS), is the sum of the squared deviation of each value of the dependent variable (Y_α) about the mean of the dependent variable for all observations ($\bar{Y}$):-

$$TSS = \Sigma(Y_\alpha - \bar{Y})^2$$

ii - A Variance, or mean square (Ms), is the average variation per degree of freedom (df):-

$$Ms = \frac{TSS}{df}$$

$$\text{Where df} = \left(\begin{array}{l}\text{No. of squared}\\ \text{deviations}\end{array}\right) - \left(\begin{array}{l}\text{No. of independent}\\ \text{points about which the}\\ \text{deviations are taken.}\end{array}\right)$$

iii - When a predictor is used to divide the sample into groups, it is described as explaining or accounting for variance in the dependent variable.

iv - The term "predictor" refers to a variable or any of the indices used to represent the sub-components of the model as outlined in the previous chapter.

some specified minimum proportion of the total sum of squares (i.e. 0.005, etc.).[1]

The process of dichotomizing groups continues until there are no eligible groups which can be split to yield the specified minimum reduction or until some specified maximum number of groups have been created (i.e. 39 final groups are possible in this version).

II. Findings

The dependent variable for the first A.I.D. analysis is the measure of need for primary curative care for each household. The potential predictors are all the 46 variables describing the four main components of the need model. These variables which have already been presumed to influence need, form the independent variables of this first analysis.

Table 8 - 2 shows that, of the 46 possible predictors of need included in this A.I.D. run, only 16 were actually used in the analysis.[2] These were the best predictors of need for primary care. The other thirty predictors which were not used in the analysis were found to be unimportant. They had either very little or no influence at all on need for primary care one way or the other.

The results shown in Table 8 - 2 substantively support the first two general hypotheses. The demographic composition,

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(1) See "Rules for stopping the splitting process" in Appendix B.

(2) Detailed information on the selection of these variables is given in Table B - 2 in Appendix B.

TABLE 8 - 2

VARIANCE EXPLAINED IN A.I.D. ANALYSIS OF NEED FOR PRIMARY CARE.

Identi-fica-tion No.	Predictor	Variance Explained
	Demographic Composition	.086
i	Household size	.032
ii	Household sex composition (% males)	.019
v	% age group 17 years and below	.007
vi	% age group 40 years and above	.025
viii	% females at child-bearing age	.003
	Socio-economic structure	.018
ix	Household income	.011
x	Occupation of main earner	.007
	Micro-environmental condition	.028
xv	Room occupancy	.003
xviii	Kitchen	.020
xxi	House sanitation (proper drainage)	.003
xxii	House cleanliness (absence of animals)	.002
	Macro-environmental setting	.114
xxiv	Sub-region	.020
xxv	Residence	.013
xxxii	Regular rubbish collection	.019
xL	Programmes for mass inoculation	.060
xLii	Regular adult education for females	.002
	R^2 (Total) (1)	.246

(1) R^2 equals total proportion of the variance explained by the analysis in this and following tables. This "R2" corresponds roughly to the "R2" of a multiple regression procedure. See Sonquist and Morgan Op.Cit, p.50.

the socio-economic, the micro-environmental and the macro-environmental components each makes a contribution to the explanation of the differences in household need for primary care. The proportion of the variance explained varies from one component to the other.(1) As expected, the proportion of the variance explained by the macro-environmental variables was the largest (i.e. 0.114). The demographic composition component had the next largest proportion (i.e. 0.086). The micro-environmental and the socio-economic components were third and fourth (0.028, 0.018) respectively. These findings generally confirm the previous findings of the correlation analysis. Among the macro-environmental variables preventive and public health measures were found to have the greatest influence on need for primary care. Mass inoculation was the most important of all the variables (0.060). Rubbish collection was also moderately important (0.019). The sub-regional and the residential sub-components were adequately represented (0.020, 0.013). Of all the indices representing the social welfare environment only adult education for females was shown to have some influence on the household need for primary care even though it was

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(1) In this and subsequent analyses the term "variance explained" refers to proportion of total variation $(TSS)_T$ accounted for by a predictor (X) or (a group of predictors) and is equal to:-

$$\frac{TSS_{ix} - TSS_{jx}}{(TSS)_T}$$

Where i is the overall parent groups split by predictor xj, and j is the overall new groups formed by splitting a parent group on predictor (X). See the programme algorithm in Appendix B. For other important formulae used in the A.I.D. programme see Sonquist and Morgan (1964), Op. Cit., p.145-148.

not great (0.002). Surprisingly, the curative environment had no influence on the extent of need for primary care whatsoever. However, its influence must have been included in both the sub-regional and the residential environments where sub-regional and residential differences would include differences in the provision of curative facilities.

Among the variables representing the demographic composition component, the household size accounted for the greatest variance (.032). Next in importance within this component was the age group 40 years and above (.025). The sex composition was third in importance (.019). Both the age group 17 years and below and females at child-bearing age were represented though their influence on need for primary care was much lower than the previous ones (.007, .003). Age groups 5 years and below and 50 years and above were not used in the A.I.D. analysis. This confirms the earlier findings of the correlation analysis. These age groups have no apparent influence on need for primary care. Generally, people in these age groups were shown to have no greater need for primary care than others.

Among the variables representing the micro-environmental component the availability of a kitchen accounted for the greatest variance (0.020). None of the other household facilities seemed to have any causal influence on need for primary care. The high importance that was attached to these variables in the correlation analysis could have been merely due to their intercorrelation with other important variables. Room occupancy, sanitation and cleanliness were represented though the variance explained by each of them was comparatively low (i.e. .003, .003, .002). The quality of the house structure was not used in the A.I.D. analysis. It had no direct influence on need for primary care.

The socio-economic component was represented by household income and occupation of the main earner both of which had some modest influence on need for primary care (.011, .007). The variables representing the level of awareness, i.e. educational levels of the head, the mother, and the oldest member as well as the percentage of children at school were not important.

III. The Relative Importance of the Components

The third general hypothesis of the need model is concerned with the relative importance of the components. Both Table 8 - 1 and 8 - 2 previously discussed reflected the general importance of the variables representing each component with respect to the need for primary curative care. Table 8 - 3 summarizes these findings, as expressed by the A.I.D. analysis. It shows the percentage of the explained variance attributed to each component and its respective sub-components. The table shows that the macro-environmental and the demographic composition components stand out as the most important of all the components. The other two components, i.e. the micro-environmental and the socio-economic, are generally of less importance to the determination of need for primary care. The macro-environmental assumed the top position in importance. It accounted for something under half of the total explained variance (46.3%). The

TABLE 8 - 3

PER CENT OF EXPLAINED VARIANCE IN NEED FOR PRIMARY CARE ATTRIBUTED TO MAIN COMPONENTS AND SUB-COMPONENTS.

Sub-component	Per cent of total explained variance
Demographic composition	35.0
Household size	13.0
Household sex composition	7.7
Household age structure	14.3
Socio-economic structure	7.3
Household income	4.5
Occupation of main earner	2.8
Household level of awareness	0.0
Micro-environmental condition	11.4
Room occupancy	1.2
Household facilities	8.2
House sanitation	1.2
House cleanliness	0.8
Quality of house structure	0.0
Macro-environmental setting	46.3
Sub-region	8.2
Residence	5.2
Curative environment	0.0
Public and preventive health environment	32.1
Social welfare environment	0.8
Total	100.0

demographic composition assumed the second position in importance. It accounted for something over one third of the explained variance (35%). These two components together accounted for about four fifths of the explained variance. The micro-environmental and the socio-economic components together accounted for only one fifth of the explained variance. The micro-environmental component was slightly more important (11.4%) than the socio-economic component (7.3%).

Among all the sub-components of the model, the public and preventive health sub-component was shown to be the one that had the greatest influence on need for primary care. By itself it accounted for about one third of the explained variance (32.1%). If need for primary curative care is to be substantially reduced in the Blue Nile region, primary consideration should be given to settlements where no public and preventive measures were taken. It should be pointed out that the provision of public health and preventive measures in itself will not eliminate need for primary care, but only reduce it effectively.

The age structure sub-component was shown to be the one which had the next greatest influence on need for primary care. The sub-component of the age structure accounts for nearly half of the variance explained by the public and preventive sub-component (14.3%). Special attention should be given to the different age groups if need for primary care is to be reduced effectively.

The sub-component of household size was nearly as important as the age structure in determining need for primary care. It accounted for 13% of the explained variance while age structure accounted for 14.3%. Need for primary care would be effectively reduced in the region if the traditional set-up of large extended families was preserved and encouraged.

The sub-regional, the household facilities, and to a certain extent the sex composition sub-components were next in importance to household size. Each of these sub-components accounted for nearly two thirds of the variance explained by the household size (i.e. 8.2%, 8.2%, 7.7%). If certain attention was given to differences in these factors need for primary care would also be substantially reduced.

The residential (urban-rural) and the household income sub-components were next in importance to the last sub-component mentioned. They accounted for 5.2% and 4.5% respectively of the explained variance. If more attention was paid to differences in these factors, need for primary curative care would also be effectively reduced.

Sub-components like occupation of the head, room occupancy, house sanitation, house cleanliness and social welfare environment were last in importance (2.8%, 1.2%, 1.2%, .8%, .8%). Each of these sub-components had some influence on need for primary care, though not much. If more positive action was taken in these factors, the need for primary care would be reduced to a certain extent.

The level of awareness and the curative environmental sub-components showed no influence on the extent of need for primary care. This implies that the extent of need for primary care would neither increase nor decrease due to any action concerning these two sub-components in the region.

IV. The Analytical Process

The foregoing discussions reflected the general trend in the analysis of need for primary care. Tables 8 - 2 and 8 - 3 gave the results of the A.I.D. analysis. However, these results do not indicate the interaction effects among the predictors. It had been postulated in the previous chapter that the influence of the components or their respective sub-components would not be uniform on all the households. The correlation analysis discussed earlier reflected the relationship of need for primary care when the effect of each factor was assumed to be uniform on all the households. This assumption is not necessarily true. An examination of the A.I.D. process will throw some light on the specific influence of the variables and their interaction effects.

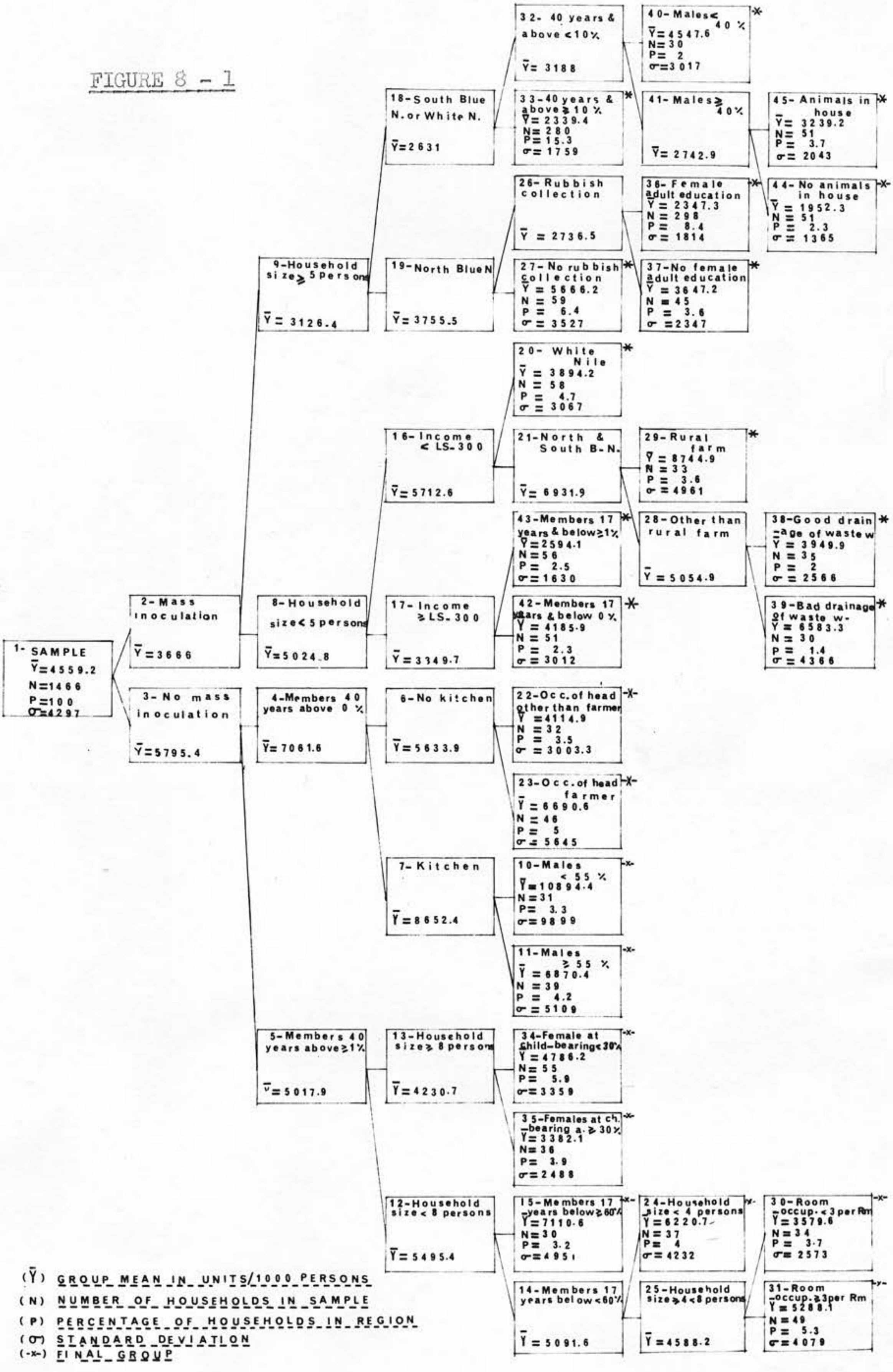
Figure 8 - 1 provides a more detailed view of the A.I.D. analysis of need for primary care. It is a graphic illustration of the splits performed during the analysis. Twenty two splits are carried out. The figure is referred to as "tree". It shows the following information:-

1. The splits taking place with the resulting classes of predictors in each sub-group;
2. The mean value of need for primary care (per 1,000 population) ($\bar{Y}$) of each sub-group;
3. The number of households (N) in each final

FIGURE 8 - 1

PREDICTOR TREE FOR THE A.I.D. ANALYSIS OF NEED FOR PRIMARY CARE

FIGURE 8 - 1


1- SAMPLE Ȳ=4559.2 N=1466 P=100 σ=4297
2-Mass inoculation Ȳ=3666
3- No mass inoculation Ȳ=5795.4
9-Household size ≥ 5 persons Ȳ= 3126.4
8-Household size < 5 persons Ȳ=5024.8
4-Members 40 years above 0 % Ȳ= 7061.6
5-Members 40 years above ≥1% Ȳ=5017.9
18-South Blue N. or White N. Ȳ=2631
19-North Blue N Ȳ= 3755.5
16-Income < LS-300 Ȳ=5712.6
17-Income ≥ LS-300 Ȳ=3349.7
6-No kitchen Ȳ=5633.9
7-Kitchen Ȳ=8652.4
13-Household size ≥ 8 persons Ȳ=4230.7
12-Household size < 8 persons Ȳ=5495.4
32- 40 years & above < 10% Ȳ= 3188
33-40 years & above ≥ 10 % Ȳ=2339.4 N= 280 P= 15.3 σ= 1759
26- Rubbish collection Ȳ = 2736.5
27- No rubbish collection Ȳ = 5666.2 N = 59 P = 6.4 σ = 3527
20- White Nile Ȳ = 3894.2 N = 58 P = 4.7 σ = 3067
21-North & South B-N. Ȳ= 6931.9
43-Members 17 years & below ≥1% Ȳ=2594.1 N=56 P= 2.5 σ=1630
42-Members 17 years & below 0 % Ȳ = 4185.9 N = 51 P = 2.3 σ = 3012
22-Occ. of head other than farmer Ȳ =4114.9 N = 32 P = 3.5 σ = 3003.3
23-Occ. of head farmer Ȳ = 6690.6 N = 46 P = 5 σ = 5645
10-Males < 55 % Ȳ=10894.4 N=31 P= 3.3 σ=9899
11-Males ≥ 55 % Ȳ = 6870.4 N = 39 P = 4.2 σ = 5109
34-Female at child-bearing < 30% Ȳ = 4786.2 N= 55 P= 5.9 σ=3359
35-Females at ch. -bearing a. ≥ 30% Ȳ=3382.1 N=36 P= 3.9 σ=2488
15-Members 17 -years below ≥ 60% Ȳ=7110.6 N=30 P= 3.2 σ=4951
14-Members 17 years below < 60% Ȳ = 5091.6
40-Males < 40 % Ȳ=4547.6 N=30 P= 2 σ=3017
41-Males ≥ 40% Ȳ= 2742.9
36-Female adult education Ȳ = 2347.3 N = 298 P = 8.4 σ = 1814
37-No female adult education Ȳ = 3647.2 N = 45 P = 3.6 σ = 2347
29-Rural farm Ȳ = 8744.9 N = 33 P = 3.6 σ = 4961
28-Other than rural farm Ȳ = 5054.9
24-Household size < 4 persons Ȳ=6220.7 N= 37 P= 4 σ= 4232
25-Household size ≥ 4 < 8 persons Ȳ = 4588.2
45- Animals in house Ȳ= 3239.2 N= 51 P= 3.7 σ= 2043
44- No animals in house Ȳ = 1952.3 N = 51 P = 2.3 σ = 1365
38-Good drainage of waste w Ȳ = 3949.9 N = 35 P = 2 σ = 2566
39-Bad drainage of waste w- Ȳ = 6583.3 N = 30 P = 1.4 σ = 4366
30-Room occup. < 3 per Rm Ȳ = 3579.6 N = 34 P = 3.7 σ= 2573
31-Room occup. ≥ 3 per Rm Ȳ = 5288.1 N = 49 P = 5.3 σ= 4079
(Ȳ) GROUP MEAN IN UNITS/1000 PERSONS
(N) NUMBER OF HOUSEHOLDS IN SAMPLE
(P) PERCENTAGE OF HOUSEHOLDS IN REGION
(σ) STANDARD DEVIATION
(-x-) FINAL GROUP

group;[1]

4. The adjusted percentage of households (P) in each final group in the region; and
5. The standard deviation (σ) (per 1,000 population) in each final group.

The splits are ordered according to the unexplained variance they accounted for. Thus, the first split accounted for more of the difference in need for primary care than any other dichotomous split for any predictor. The second, third, fourth, etc. splits accounted for less difference respectively.

The first group in the tree indicated the mean need for primary care for all the households in the region (4,559.2 units per 1,000). In the A.I.D. analysis the differences in the sample ratios of urban, semi-urban and rural areas had been adjusted for by the use of weighting factors.[2] The rest of the tree showed which characteristics were able to separate the most needy households from the less needy ones in relation to primary care.

Mass inoculation provided the initial split. Households

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(1) A summary of the characteristics and estimated need for the final groups is given in a later part of this section (See Table 8 - 4).

(2) In order to bring the ratio of households in the different sample sub-frames to the same level a weight of 1 was given to all urban households, 3 to all semi-urban households, and 8 to rural households. The weighting factors are in keeping with the sampling ratios already selected during the sampling procedure (See sampling procedure in Chapter 6.).

which resided in settlements where mass inoculation had been carried out (Group 2) had low needs for primary care as indicated by their mean of 3,666 units per 1,000 population. In contrast those households which resided in settlements where no mass inoculation had been carried out (Group 3) had high needs as indicated by their mean of 5,795.4 units per 1,000 population.

The age structure accounted for the second best split. At this stage the percentage of people 40 years and above was important only in relation to households that resided in settlements where no mass inoculation had been carried out. Households with no members at 40 years and above (Group 4) had higher mean needs amounting to 7,061.6 units per 1,000 population than households with at least one member 40 years and above (Group 5) with mean needs amounting to 5,017.9 units per 1,000 population. Contrary to our expectation, younger people in this case were found to be more in need of primary care than older people when no mass inoculation has been done. It seemed that older people had more natural immunity against disease than younger people in this region.

The availability of kitchens in the house accounted for the third split. Contrary to our expectations also, households where all the household members were below 40 years of age and had no kitchens in the house (Group 6) had lower mean needs amounting to 5,633.9 units per 1,000 than households which had kitchens in the house (Group 7) with mean needs amounting to 8,652.4 units per 1,000. This indicated that the availability of a kitchen in the house was more of a health hazard than an amenity. The health standard in kitchens in the region and specially in rural areas must have been dangerously unhygienic that it would be rewarding healthwise not to have one.

The size of the household offered the fourth best split. At this stage the importance of size was reflected on households residing in settlements where mass inoculation had been carried out. As expected, small households of sizes less than five persons (Group 8) had higher mean needs amounting to 5,024.8 units per 1,000, than large households of sizes equal to five persons or more (Group 9) with mean needs amounting to 3,126.4 units per 1,000.

The fifth split was provided by the sex composition predictor. It applied to households which had kitchens (Group 7). Households where males constituted a lower percentage than 55 (Group 10) had higher mean needs amounting to 10,894.4 units per 1,000 than those where males constituted 55 per cent or more (Group 11) with mean needs amounting to 6,870.4 units per 1,000. In other words, this indicated that members of the female sex had higher needs for primary care than their male counterparts.

Again the size of the household offered the sixth split. It applied to households with at least one member 40 years and above (Group 5). Small households of sizes less than eight persons (Group 12) had higher mean needs amounting to 5,495.4 units per 1,000 than large households of a size eight persons or more (Group 13) with mean needs amounting to 4,230.7

units per 1,000.

The seventh split indicated the importance of the age group 17 years and below on small sized households of less than eight persons (Group 12). Households where members in the age group 17 years and below (Group 14) constituted a percentage lower than 60, had lower mean needs amounting to 5,091.6 units per 1,000 than those where members in this age group constituted 60 per cent or more (Group 15) with mean needs amounting to 7,110.6 units per 1,000. This implied that young people of 17 years or less had higher needs for primary care than others.

The eighth split indicated the importance of household incomes on small sized households of less than five persons (Group 8). Households with yearly incomes less than LS 300[1] (Group 16) had higher mean needs amounting to 5,712.6 units per 1,000 than those with yearly incomes of LS 300 or more (Group 17) with mean needs amounting to 3,349.7 units per 1,000.

The ninth split indicated the importance of the sub-regional environment on large sized households of five persons or more (Group 9). Households in either South Blue Nile or White Nile sub-regions (Group 18) had lower mean needs amounting to 2,631 units per 1,000 than those in the North Blue Nile sub-region (Group 19) with mean needs amounting to 3,755.5 units per 1,000. This implied that the impact of household size was much greater in the South Blue Nile and White Nile than in

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(1) LS (Sudanese Pounds) = 119.5 British New Pence approximately.

the North Blue Nile sub-region. The evidence supported the earlier assumption that due to the open canalization system of irrigation in the North Blue Nile sub-region, households experienced more waterborne diseases than in other areas of the region, where there were no such large-scale irrigation systems.

The tenth split also indicated the importance of the sub-regional environment on low income households (Group 16). Households in White Nile sub-region (Group 20) had lower mean need amounting to 3,894.2 units per 1,000 than those in either North or South Blue Nile sub-regions (Group 21) with mean needs amounting to 6,931.9 units per 1,000. This implied that the impact of low income on people's health was much less pronounced in the White Nile area than any other part of the region.

The eleventh split indicated the importance of the occupation of the head of the household on younger households with no kitchens in their houses (Group 6). Households in which the main earners had occupations other than farming (Group 22) had lower mean needs amounting to 4,114.9 units per 1,000 than those in which the main earners were farmers (Group 23) with mean needs amounting to 6,690.6 units per 1,000. This implied that farming households tended to have less healthier modes of living than others.

The twelfth split stressed the importance of the household size even more in relation to households of less than 60% members in age group 17 years and below (Group 14). Households with sizes less than four persons (Group 24) had higher mean needs amounting to 6,220.7 units per 1,000 than those with sizes 4, 5, 6 or 7 members (Group 25) with mean needs amounting to 4,588.2 units per 1,000.

The thirteenth split indicated the importance of regular rubbish collection specifically in North Blue Nile sub-region (Group 19). Households residing in settlements where there was regular rubbish collection (Group 26) had lower mean needs amounting to 2,736.5 units per 1,000 than those in settlements where there was no regular rubbish collection (Group 27) with mean needs amounting to 5,666.2 units per 1,000. This reflected the jeopardy to people's health as a result of lack of a public health amenity like rubbish collection.

The fourteenth split indicated the importance of the residential environment (urban-rural) on households in North and South Blue Nile sub-regions (Group 21). Households in any settlement other than rural farm (Group 28) had lower mean needs amounting to 5,054.9 units per 1,000 than those in rural farm settlements (Group 29) with mean needs amounting to 8,744.9 units per 1,000. This implied that rural environment and especially where there was farming was the cause of many diseases.

The fifteenth split indicated the importance of the room occupancy rate on households with sizes 4, 5, 6 and 7 persons (Group 25). Households with room occupancy less than 3 persons per room (Group 30) had lower mean needs amounting to 3,579.6 units per 1,000 than those with room occupancy of 3 or more persons per room (Group 31) with mean needs amounting to 5,288.1 units per 1,000. This implied that over-crowding had been the cause of some diseases in some communities and would therefore increase their need for primary curative care.

The sixteenth split indicated the importance of the age group 40 years and above on households in South Blue Nile and White Nile sub-regions (Group 18). Households where members in age group 40 years and above constituted less than 10 per cent of the household (Group 32) had higher mean needs amounting to 3,188 units per 1,000 than those where members in this age group constitute 10 or more per cent of the household (Group 33) with mean needs amounting to 2,339.4 units per 1,000. This confirmed the earlier finding that younger people of less than 40 years of age had less natural immunity against disease and would therefore need more primary care than older people.

The seventeenth split indicated the importance of females at child-bearing age on large-sized households of eight persons or more (Group 13). Households where females at child-bearing age constituted less than 30 per cent of the female household members (Group 34) had higher mean needs amounting to 4,786.2 units per 1,000 than those where females at child-bearing age constituted 30 per cent or more (Group 35) with mean needs amounting to 3,382.1 units per 1,000. This evidence disproved the postulate made earlier that women at child-bearing age had greater need for medical care than other women. It had been proved here that such women were healthier than other women, namely the youngest and the oldest, and would therefore need less primary care than either of them.

The eighteenth split indicated the importance of female adult education programmes on those residing in settlements with regular rubbish collection (Group 26). Households where there was regular adult education for females (Group 36) had lower mean needs amounting to 2,347.3 units per 1,000 than those where there was no regular female adult education (Group 37) with mean needs amounting to 3,647.2 units per 1,000. This implied that adult education raises the general level of awareness of women and this would be reflected on their positive attitudes towards health conditions in their homes.

The nineteenth split indicated the importance of sanitation in the house on households residing in settlements other than rural farm (Group 28). Households where there was good sanitation as indicated by proper drainage of household waste water (Group 38) had lower mean needs amounting to 3,949.9 units per 1,000 than those where there was bad sanitation (Group 39) with mean needs amounting to 6,583.3 units per 1,000.

The twentieth split indicated the importance of sex composition on households where the members in the age group 40 years and above constituted less than 10 per cent (Group 32). Households where males constituted less than 40 per cent of the household members (Group 40) had higher mean needs amounting to 4,547.6 units per 1,000 than those where males constituted 40 per cent or more (Group 41) with mean needs amounting to

2,742.9 units per 1,000. This evidence supported an earlier finding that the male sex was healthier than the female sex in this region, and would therefore need less primary curative care.

The twenty-first split indicated the importance of the age group 17 years and below on high income households with yearly incomes of LS 300 or more (Group 17). Households where no member was in the age group 17 years and below (Group 42) had higher mean needs amounting to 4,185.9 units per 1,000 than those where at least one member of the household was in this age group (Group 43) with mean needs amounting to 2,594.1 units per 1,000. This evidence indicated that young people 17 years and below were healthier than others only when the household yearly income is LS 300 or more and where there was regular mass inoculation.

The twenty-second and last split indicated the importance of cleanliness in the house as reflected by the absence of loose animals within the house compound on households where males constituted 40 per cent or more (Group 41). Households where there was cleanliness in the house (Group 44) were shown to have lower mean needs amounting to 1,952.3 units per 1,000 than those where there was no cleanliness (Group 45) with mean needs amounting to 3,239.2 units per 1,000. This implied that lack of a clean environment within the house can jeopardize health and would therefore increase the need for primary care.

The ability of the A.I.D. programme to detect interaction effects was illustrated by this tree. It should be pointed out that under each condition or characteristic a different variable was most successful in differentiating households with higher need for primary care from those with lower needs. All of the sixteen predictors were each used at least once in the splits; but the size of the household was used three times. Other predictors like the age group 40 years and above, age group 17 years and below, sex composition and the sub-region were each used twice. This implies that each of these predictors had more interaction with different predictors than any of the others except for mass inoculation which provided the initial prediction. Evidence of interaction effects is more clearly illustrated in the summary of the final groups shown on Table 8 - 4. It should be noted that the various combinations of the different household environmental characteristics caused the need to fluctuate. Generally, people in greatest need for primary care were those who had no inoculation against diseases and no rubbish collection, those who were members of small families, those who were in the lower age groups, those who were members of poor families and those who had no sanitation or cleanliness in their homes, not to mention those households with high percentages of females. It is also important to note that income had no influence on either large-sized households of 5 persons or more or on those who had no mass inoculation in their settlements irrespective of size. The size of the household had no influence on households when all the members are below 40 years of age and when their settlement did not experience mass inoculation. Age structure had no influence either on large-sized households of 5 persons or more living in North Blue Nile or on households where all the members were below 40 years of age when their settlement did not experience mass inoculation. Sex composition had no influence on either small-sized households of less than 5 persons when mass inoculation was carried out or those households where at least one member was 40 years and above when mass inoculation was not carried out. Lack of sanitation and cleanliness in the house and the availability of rubbish collection or female adult education in the settlement only influenced households living in settlements where mass inoculation had been carried out. Kitchen availability, room occupancy rate and the type of occupation of the household head were effective only on households living in settlements where no mass inoculation was carried out. The Table 8 - 4 also shows that about 42.3% of the households had needs for primary care above the average while about 57.9% below the average. About 7% of the households had considerably high needs for primary care above 8,744 units per 1,000 (Groups 10 and 29) while 2.3% had considerably low needs below 2,000 units per 1,000 (Group 44).

It is also important to point out the degree of precision in predicting need for primary care with the sixteen selected predictors as reflected by the low proportion of unexplained variance in each final group. With the exception of Group 10 where the unexplained variance amounts to 17.7%, each of the final groups had a low proportion of unexplained variance ranging between a maximum of 8.5% and a minimum of 0.2%.

TABLE 8 - 4

CHARACTERISTICS OF FINAL GROUPS IN ANALYSIS OF NEED FOR PRIMARY CARE.

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
10	31	3.3	10 894.4	0.177	No mass inoculation in settlement; No member 40 years and above; Kitchen available in house; Males $<$ 55%.
29	33	3.6	8 744.9	0.047	Mass inoculation in settlement; Size $<$ 5 persons; Income $<$ LS 300; In North and South Blue Nile; In rural-farm settlements.
15	30	3.2	7 110.6	0.043	No mass inoculation in settlement; At least one member 40 years and above; Size $<$ 8 persons; Members 17 years and below $\geq$ 60% or more.

TABLE 8 - 4

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
11	39	4.2	6 870.4	0.059	No mass inoculation in settlement; No member 40 years and above; Kitchen available in house; Males$\geq$55% or more.
23	46	5.0	6 690.6	0.085	No mass inoculation in settlement; No member 40 years and above; No kitchen in house; Occupation of Head: Farmer.
39	30	1.4	6 583.3	0.015	Mass inoculation in settlement; Size $<$ 5 persons; Income $<$ LS 300; In North and South Blue Nile; In settlements other than rural farm; Bad sanitation in house.

TABLE 8 - 4

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
24	37	4.0	6 220.7	0.039	No mass inoculation in settlement; At least one member 40 years and above; Size $<$ 4 persons; Members 17 years and below $<$ 60%.
27	59	6.4	5 666.2	0.043	Mass inoculation in settlement; Size $\geq$ 5 persons or more; In North or South Blue Nile; No regular rubbish collection.
31	49	5.3	5 288.1	0.048	No mass inoculation in settlement; At least one member 40 years and above; Size=4, 5, 6 or 7 persons; Members 17 years and below $<$ 60%; Room occupancy $\geq$ 3 or more.

TABLE 8 - 4

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
34	55	5.9	4 786.2	0.036	No mass inoculation in settlement; At least one member 40 years and above; Size $\geq$ 8 persons or more; Women at child-bearing age $\geq$ 30% or more.
40	30	2.0	4 547.6	0.010	Mass inoculation in settlement; Size $\geq$ 5 persons or more; In South Blue Nile or White Nile; Members 40 years and above $<$ 10%; Males $<$ 40%.
42	51	2.3	4 185.9	0.011	Mass inoculation in settlement; Size $<$ 5 persons; Income $\geq$ LS 300 or more; No member 17 years and below.

TABLE 8 - 4

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) ×	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
22	32	3.5	4 114.9	0.017	No mass inoculation in settlement; No members 40 years and above; No kitchen in house; Occupation of Head: Other than farmer.
38	35	2.0	3 949.9	0.007	Mass inoculation in settlement; Size $<$ 5 persons; Income $<$ LS 300; In North or South Blue Nile; In settlements other than rural farm; Good sanitation in house.
20	58	4.7	3 894.2	0.024	Mass inoculation in settlement; Size $<$ 5 persons; Income $<$ LS 300; In White Nile.

TABLE 8 - 4

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
37	45	3.6	3 647.2	0.011	Mass inoculation in settlement; Size $\geq$ 5 persons or more; In North Blue Nile; Regular rubbish collection; No regular female adult education in settlement.
30	34	3.7	3 579.6	0.013	No mass inoculation in settlement; At least one member 40 years and above; Size=4, 5, 6 or 7 persons; Room occupancy rate $<$ 3.
35	36	3.9	3 382.1	0.013	No mass inoculation in settlement; At least one member 40 years and above; Size $\geq$ 8 persons or more; Women at child-bearing age$\geq$30% or more.

TABLE 8 - 4

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
45	51	3.7	3 239.2	0.008	Mass inoculation in settlement; Size $\geq$ 5 persons or more; In South Blue Nile or White Nile; Members 40 years and above < 10%; Males $\geq$ 40% or more; No cleanliness in house.
43	56	2.5	2 594.1	0.004	Mass inoculation in settlement; Size < 5 persons; Income $\geq$ LS 300 or more; At least one member 17 years and below.
36	298	8.4	2 347.3	0.015	Mass inoculation in settlement; Size $\geq$ 5 persons or more; In North Blue Nile; Regular rubbish collection; Regular female adult education in settlement.

TABLE 8 - 4

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) (1) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
33	280	15.3	2 339.4	0.026	Mass inoculation in settlement; Size $\geq$ 5 persons or more; In South Blue Nile or White Nile; Members 40 years and above $\geq$ 10% or more.
44	51	2.3	1 952.3	0.002	Mass inoculation in settlement; Size $\geq$ 5 persons or more; In South Blue Nile or White Nile; Members 40 years and above $<$ 10%; Cleanliness in house.

Mean for all households in region = 4 559.2 units/1000 population.

x Total does not add up to 100% because of rounding up.

(1) Unexplained variance in Group refers to the variance within the Group still not accounted for as a proportion of the total unexplained variance in the whole sample; i.e. $(TSS)_i/(TSS)_T$ gives the proportion for Group (i).

8.2.0 NEED FOR INTERMEDIATE CARE

A household's need for intermediate care has been defined as the extent of a household's need for hospital care in a year. This type of care can effectively be provided for in such curative institutions as Class B or C hospitals in the region. Such institutions can provide for a higher level of care (diagnosis and treatment) than that which is being provided for in primary care institutions, i.e. dispensaries and dressing stations.

8.2.1 Correlation Analysis of Need for Intermediate Care

I. Method

In order to find out the strength and direction of association of the various sub-components of the need model with need for intermediate care, simple correlations are carried out. As pointed out earlier, such correlations show the monotonic relationship under assumptions of linearity and additivity.

II. Findings

The results of the correlation analysis are given in Table 8 - 5. As in the case of primary care need, the table shows that a significant relationship existed between this type of need and almost every sub-component of the model. As expected, the macro-environmental component was found to be most closely associated with this type of need even though the magnitudes of the correlation coefficients of most of its vari-

TABLE 8 - 5

CORRELATION OF EXPLANATORY VARIABLES WITH NEED FOR INTERMEDIATE CARE.

Independent Variable			Correlation Coefficient
Component	Identification No.	Sub-components	
Demographic composition	i	Household size	-.222
	ii	Household sex composition (% males)	.007 ×
		Household age structure:-	
	iii	% 1 year and below	-.001 ×
	iv	% 5 years and below	.065
	v	% 17 years and below	-.060
	vi	% 40 years and above	-.047
	vii	% 50 years and above	-.020 ×
	viii	% Females at child-bearing age	.105
Socio-economic structure	ix	Household income	-.189
	x	Occupation of Head	-.042
		Household level of awareness:-	
	xi	Educational level of Head	-.093
	xii	Educational level of Mother	-.052
	xiii	Educational level of Oldest	.054
	xiv	% children at school	-.189
Micro-environmental condition	xv	Room occupancy	.019 ×
		Household facilities:-	
	xvi	W.C. or latrine	-.217
	xvii	Bathroom	-.191
	xviii	Kitchen	-.090
	xix	Food storage	-.153
	xx	Water tap inside	-.244
	xxi	House sanitation (proper drainage)	-.181
	xxii	House cleanliness (absence of animals)	-.121
	xxiii	Quality of house structure	-.177
Macro-environmental setting	xxiv	Sub-region (Ranked)	-.111
	xxv	Residence (Ranked)	-.290
		Curative environment:-	
	xxvi	General curative facilities	-.272
	xxvii	Health centre or Maternity Clinic	-.256
	xxviii	Special non-general hospital	-.138
	xxix	Private Clinic	-.278

TABLE 8 - 5

..CONTINUED

Independent Variable			Correlation Coefficient
Component	Identification No.	Sub-components	
Macro-environmental setting	xxx	Drugstore	-.204
	xxxi	Local Healer (Osteopath)	-.206
		Public and Preventive Health Environment:-	
	xxxii	Regular rubbish collection	-.280
	xxxiii	Regular street cleaning	-.301
	xxxiv	Adequate rain water disposal	-.227
	xxxv	Regular stagnant water treatment	-.215
	xxxvi	Piped drinking water system	-.247
	xxxvii	Regular house health inspection	-.298
	xxxviii	Regular house spraying or fumigation	-.277
	xxxix	Programmes for malaria eradication	-.201
	xL	Programmes for mass inoculation	-.303
		Social welfare environment:-	
	xLi	Regular adult education - males	-.236
	xLii	Regular adult education - females	-.233
	xLiii	Regular health education	-.198
	xLiv	Regular cookery or dietary instructions	-.211
	xLv	Regular embroidery or artisan classes	-.195
	xLvi	Regular visits by health visitor	-.264

x Not significant at the .01 level.

- Negative association.

ables seemed to be a bit less than in the case of primary care need. In fact, the table shows that the magnitude of correlation coefficients in relation to almost all the sub-components of the model tended to be lower than in the first case. This implied that in general the impact of such sub-components on the need for intermediate care was less pronounced than their impact on the need for primary care. However, households which resided in settlements where mass inoculation programmes had been carried out tended to have the lowest need for intermediate care. Moreover, households which resided in places where there had been regular street cleaning, regular house health inspection, regular rubbish collection, private clinics, regular house spraying or fumigation, high levels of general curative facility, regular visits by health visitors and a health centre or maternity clinic, tended to have fewer needs for intermediate care than those which resided in settlements without such facilities. The best predictors of need for intermediate care were shown to be the provision of mass inoculation programmes, street cleaning, regular house health inspection and rubbish collection. These predictors were shown to have the highest correlation with this type of need. The other macro-environmental predictors, though they had lower magnitudes of correlation than those mentioned, were still nearly as important. Such facilities were probably highly intercorrelated. Settlements that had a high standard of public and preventive health measures were also those where high levèls of curative facilities and social welfare programmes were provided.

Table 8 - 5 revealed that the micro-environmental sub-components were next to the macro-environmental sub-components in magnitude of correlation. However, because of the probability of a high standard of living conditions in settlements where high level of public and preventive health as well as curative and social welfare facilities were provided, such high correlations attributed to the micro-environmental sub-components might merely reflect high intercorrelation, and not necessarily a causal effect on intermediate care needs. The availability of a water tap inside the house, the presence of a w.c. or latrine and a bathroom, the maintenance of good sanitation and living in a house of a high quality and structure, were found to be amongst the best predictors of intermediate care needs within this component. Room occupancy was shown to have an insignificant relationship with this type of need. The availability of a kitchen had a significant but rather low association.

The demographic composition sub-components, and in particular the size of the household, assumed a third place in importance in relation to this type of need. Households of large size were shown to have less need for intermediate care than small-sized households. Sex composition, age groups one year and below and 50 years and above, were shown to be insignificantly associated with this type of need. Households with a high percentage of females in the child-bearing age had more needs for intermediate care than those with low percentage of females in this age group. The correlations also indicated that households with high percentages of members in either the age group 17 years and below or the age group 40 years and above, had less need for intermediate care, than those with low percentages in these age groups. But households with high percentage of members in the age group 5 years and below were shown to have more needs for this type of care than those with low percentage in this age group. It should be noted that in all these cases the magnitudes of correlation were comparatively much lower than that for size.

The sub-components representing the socio-economic component were shown to be fourth in importance. None of the sub-components belonging to this component had a correlation coefficient higher than the most important predictor in any of the other components previously mentioned. But the relationship of need for intermediate care with each of the sub-components in this category was still significant. Households with high incomes, high occupational status of heads, high level of awareness as represented by the educational level of heads, the educational level of mothers or the percentage of children at school, were shown to have less need for this type of care than those with low awareness levels. The educational level of oldest members showed a positive association with this type of need implying that households where the oldest members had high levels of education were more in need of intermediate care than those where the oldest members had low educational levels. This tendency might show that where such highly educated old members existed, they tended to influence the household members to be more hypochondriac. However, the A.I.D. analysis, which follows, will show whether this positive association indicates any causal relationship with this type of need.

In sum, Table 8 - 5 shows, with a few minor exceptions, that households differ in their need for intermediate care for similar reasons to those indicated in the case of need for primary care. This is logical enough since intermediate care need by definition was only part of primary need. The A.I.D. which follows will help to clarify the nature of these relationships more than has so far been indicated.

8.2.2 A.I.D. Analysis of Need for Intermediate Care

I. Method

The dependent variable in this case is the household's need for intermediate curative care (i.e. need for hospitalization) as calculated for each household from the survey results together with the weighting factors proposed in Chapter 7 (refer to Table 7 - 1 for weights). The potential predictors are all the 46 indices describing the four main components of the model: i.e. households' demographic composition, households' socio-economic structure, households' micro-environmental condition and households' macro-environmental setting.

II. Findings

Table 8 - 6 shows that, of the 46 possible predictors of need included in this A.I.D. run, only 10 were actually used in the analysis.(1) These were the best predictors of need for

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(1) Detailed information on the selection of these variables is summarized in Table 8 - 3 Appendix 8.

TABLE 8 - 6

VARIANCE EXPLAINED IN A.I.D. ANALYSIS OF NEED FOR INTERMEDIATE CARE.

Identi-fica-tion No.	Predictor	Variance Explained
	Demographic Composition	.036
i	Household size	.014
v	% age group 17 years and below	.011
vi	% age group 40 years and above	.011
	Socio-economic structure	.035
ix	Household income	.035
	Micro-environmental condition	.006
xxiii	Quality of house structure	.006
	Macro-environmental setting	.103
xxiv	Sub-region	.014
xxv	Residence	.010
xxxii	Regular rubbish collection	.008
xxxviii	Regular house spraying or fumigation	.010
xL	Programmes for mass inoculation	.061
	R^2 (Total)	.180

intermediate care (i.e. hospitalization). The other thirtysix predictors which were not used in the analysis were found to be unimportant in this case. Their influence on this type of need is either insignificant or non-existent.

The results shown on Table 8 - 6, substantively support the first two general hypotheses with regard to this type of need. The demographic composition, the socio-economic, the micro-environmental and the macro-environmental components were each shown to make an independent contribution to the explanation of the differences in household need for intermediate care. The proportion of variance explained differ from one component to the other in most cases. The proportion of variance explained by the macro-environmental component was by far the largest of those explained by each of the other components (i.e. 0.103) even though it was less than in the case of need for primary care (i.e. 0.114). The proportion of variance explained by this component was even greater than the proportion explained by all the other three components combined. Contrary to the findings of the earlier correlation analysis, the demographic composition component and not the micro-environmental component, was shown to be next in importance to the macro-environmental component (i.e. 0.036) though much lower than it had been in the case of primary care need (i.e. 0.086). The socio-economic component was shown to be almost on the same level of importance as the demographic component (i.e. 0.035). In fact, this component of the model assumed almost twice the importance it had in the case of primary care need (i.e. 0.018).

The micro-environmental component was shown to be the one that had the least influence on this type of need, contrary to the findings of the earlier correlation analysis. The proportion of variance explained by this component (i.e. 0.006) is much lower than that in the case of primary care need (i.e. 0.028). The overall explanation offered by all the components together in relation to intermediate care need was noticeably lower than that offered by these components in relation to primary care need. This implied that if positive planning action was taken in order to reduce or eliminate the effects of these components in the region, such a positive action would have more effect on the reduction of need for primary care than the reduction of need for intermediate care. But if positive action were taken to reduce the effects of the socio-economic component only, particularly income, then more reduction in the need for intermediate care than in the need for primary care would be gained.

Among the variables representing the macro-environmental component, mass inoculation had the greatest single influence on this type of need as can be seen from the proportion of variance explained by it (i.e. 0.061). Its impact on this type of need is even a little greater than its impact on need for primary care (i.e. 0.060). The sub-regional variable was next in its influence on this type of need among the variables representing this component (0.014). Residence and regular house spraying or fumigation were both equally influential on this type of need (i.e. 0.010 each). Rubbish collection had the least influence on this type of need amongst all the significant variables representing this component (i.e. 0.008). Both curative and social welfare environments did not show any influence on need for intermediate care. This influence could have already been included in the variables representing the sub-regional as well as the residential environments.

Among the variables representing the demographic composition component, the size of the household had the strongest influence on this type of need (i.e. 0.014). Both age groups 17 years and below and 40 years and above had equally moderate influence on this type of need (i.e. 0.011 each). However, confirming the earlier correlation analysis, neither age groups 1 year and below or 50 years and above variables nor the sex composition variable had any significant influence on this type of need. Contrary to the correlation analysis the percentage of females in the child-bearing age did not show any influence on this type of need.

Among the variables representing the socio-economic component, only income was shown to have influence (0.035). Income was shown to be the second most influential single variable after mass inoculation (0.061) in the macro-environmental component. Neither the occupation of head nor the variables representing the awareness level were shown to have any influence on this type of need. The earlier results of the correlation analysis reflecting a comparatively high association of awareness level variables particularly as indicated by the percentage of children at school could have been merely due to some high intercorrelation between this variable and income, rather than a causal relation of this variable and need for intermediate care.

The influence of the micro-environmental component on need for intermediate care was represented only bythe quality of house structure. The influence of this variable was shown to be the lowest of all the significant variables in all the components (i.e. 0.006). Neither the occupancy rate, nor any of the variables representing the house facilities nor the sanitation and cleanliness variables indicated any influence on this type of need. However, their influence could have been included in the variable representing the quality of the house, income, sub-region or residence, i.e. that there was probably high correlation of the former variables with one or more of the latter variables.

III. The Relative Importance of the Components

The third general hypothesis of the need model is concerned with the relative importance of the components. Both Table 8 - 5 and 8 - 6 reflected the general importance of the variables representing the components. The discussion pursued also indicated the relative importance of these components in relation to need for intermediate care. Table 8 - 7 summarizes these findings by expressing the percentage of explained variance attributed to each component and its respective sub-components. The table shows that the relative importance of the macro-environmental component is greater in relation to the intermediate care need (57.3%) than it had been in

TABLE 8 - 7

PER CENT OF EXPLAINED VARIANCE IN NEED FOR INTERMEDIATE CARE ATTRIBUTED TO MAIN COMPONENTS AND SUB-COMPONENTS.

Sub-component	Per cent of total explained variance
Demographic composition	20.0
Household size	7.8
Household sex composition	0.0
Household age structure	12.2
Socio-economic structure	19.4
Household income	19.4
Occupation of main earner	0.0
Household level of awareness	0.0
Micro-environmental condition	3.3
Room occupancy	0.0
Household facilities	0.0
House sanitation	0.0
House cleanliness	0.0
Quality of house structure	3.3
Macro-environmental setting	57.3
Sub-region	7.8
Residence	5.6
Curative environment	0.0
Public and preventive health environment	43.9
Social welfare environment	0.0
Total	100.0

relation to the primary care need (46.3%). In relation to this type of need, it accounted for more than half the total explained variance. The demographic composition almost shared the second place in importance with the socio-economic structure (19.4%) in relation to this type of need, while it had unrivalled second place in importance in relation to the need for primary care (35%). Accordingly, its relative importance had been reduced in relation to this type of need. It would have less influence on need for intermediate care than it had on need for primary care. On the other hand, the socio-economic component had increased considerably in importance in relation to this type of need (19.4%) from its position in relation to primary care need (7.3%). The relative importance of the micro-environmental component had been lowered in relation to this type of need (3.3%) from its importance in relation to primary care need (11.4%).

Among all the sub-components of the model, the public and preventive health sub-component was shown to be still the one that had the greatest influence on need for intermediate care. Its relative influence on this type of need (43.9%) exceeded its earlier relative influence on need for primary care (32.1%). In order to reduce need for intermediate care substantially in the Blue Nile region, primary attention should be given to settlements where no public health and preventive measures had been taken. Of particular importance in this respect were mass inoculation, house spraying and rubbish collection.

The household income sub-component was shown to be the one which had the next greatest influence on need for intermediate care. Its relative influence on this type of need (19.4%) exceeded its earlier relative influence on need for primary care (4.5%). In order to reduce this type of need effectively, special attention should also be paid to low income households.

The household age structure sub-component was shown to be third in influence on need for intermediate care. It accounted for 12.2% of the explained variance. This, however, indicated a relative decrease in influence to the one it had on need for primary care (14.3%).

The size of the household and the sub-regional sub-components were shown to be of equal influence on need for intermediate care. Both of these sub-components assumed fourth place and each accounted for 7.8% of the explained variance. This percentage, however, indicated a relative decrease in influence to the one each had on need for primary care (13% for household size and 8.2% for sub-region).

Residence and quality of house structure sub-components were shown to be in fifth and sixth place respectively in influence on need for intermediate care (5.6% and 3.3%). For both these sub-components, this indicated an increase in influence relative to this type of need on that which each had relative to need for primary care (5.2% for residence and 0% for quality of house).

The sub-components representing sex composition, occupation of main earner, household level of awareness, room occupancy rate, household facilities, house sanitation, house cleanliness, curative environment and social welfare environment were shown to have no significant influence on the need for intermediate care. For sex composition, occupation of main earner, room occupancy, household facilities, house sanitation, house cleanliness and social welfare environment sub-components, this indicated a loss in influence relative to this type of need in comparison with the influence each had relative to the need for primary care (7.7%, 2.8%, 1.2%, 8.2%, 1.2%, 0.8% and 0.8% respectively). For household level of awareness and curative environment sub-components this indicated simply no change in the situation.

It should be pointed out that to a great extent these findings supported the third general hypothesis of the need model that the relative importance of each component (and its respective sub-components) will vary according to the type of need considered. These variations are largely due to the variation in the priority of the disease categories that people experience and which determine the level of need.

IV. The Analytical Process

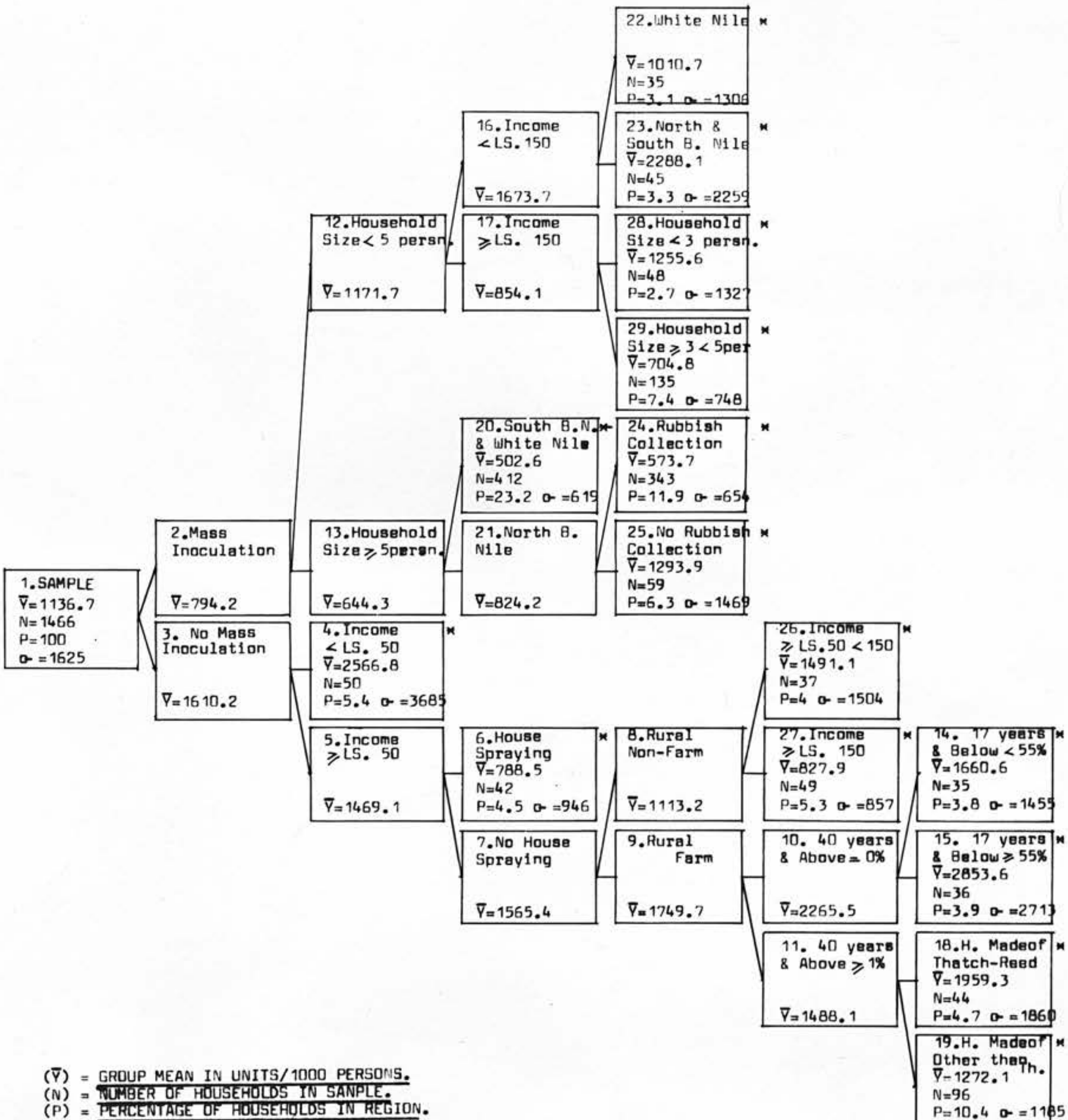
In order to understand more about how and why households in the region differ in their needs for intermediate care (i.e. hospitalization needs), it is necessary to examine the prediction tree which demonstrates the A.I.D. process.

Figure 8 - 2 provides a more detailed view of the analysis of need for intermediate care. It is a graphic representation of the split process performed during the A.I.D. ana-

FIGURE 8 - 2

PREDICTOR TREE FOR THE A.I.D. ANALYSIS OF NEED FOR INTERMEDIATE CARE

FIGURE 8 - 2



(V̄) = GROUP MEAN IN UNITS/1000 PERSONS.
(N) = NUMBER OF HOUSEHOLDS IN SAMPLE.
(P) = PERCENTAGE OF HOUSEHOLDS IN REGION.
(σ) = STANDARD DEVIATION.
(*) = FINAL GROUP.

lysis. Fourteen splits were carried out. The first group in the tree indicated the mean need for intermediate care for all households in the region (i.e. 1,136.7 units per 1,000). The rest of the tree showed which characteristics were able to separate the most needy households from the less needy ones in relation to intermediate care.

Mass inoculation provided the initial split. Households which resided in settlements where mass inoculation had been carried out (Group 2) had low needs for intermediate care as indicated by their mean of 794.2 units per 1,000 population. In contrast, those households which resided in settlements where no mass inoculation had been carried out (Group 3) had high needs as indicated by their mean of 1,610.2 units per 1,000 population.

Income accounted for the second best split on households where no mass inoculation was carried out (Group 3). Households which had yearly incomes of less than LS 50 (Group 4) had more needs, amounting to 2,566.8 units per 1,000, than those which had yearly incomes of LS 50 or more (Group 5) with mean needs amounting to 1,469.1 units per 1,000.

House spraying or fumigation accounted for the third best split on households with higher incomes of LS 50 or more (Group 5). Households in settlements where house spraying or fumigation had been carried out (Group 6) had less needs, amounting to 788.5 units per 1,000, than those in settlements where no spraying or fumigation was carried out (Group 7) with mean needs amounting to 1,565.4 units per 1,000.

Residence accounted for the fourth best split on households where there had been house spraying or fumigation (Group 7). It should be noted that Group 7 incorporated households residing only in rural areas. Households in rural non-farm (Group 8) had less needs, amounting to 1,113.2 units per 1,000 than those in rural farm (Group 9) with mean needs amounting to 1,749.7 units per 1,000.

The age group 40 years and above accounted for the fifth split on households living in rural farm settlements (Group 9). Households where no member was 40 years and above (Group 10) had more needs, amounting to 2,265.5 units per 1,000, than those where at least one member was 40 years and above (Group 11) with mean needs amounting to 1,488.1 units per 1,000.

Household size accounted for the sixth split on households where mass inoculation had been carried out (Group 2). Small-sized households of less than 5 members (Group 12) had more needs, amounting to 1,171.7 units per 1,000, than large-sized households of 5 members or more (Group 13) with mean needs amounting to 644.3 units per 1,000.

The age group 17 years and below accounted for the seventh split on households with no member 40 years and above (Group 10). Households where members in age group 17 years and below constituted percentages less than 55 (Group 14) had less needs, amounting to 1,660.6 units per 1,000, than those where members in age group 17 years and below constituted percentages of 55 or more (Group 15) with mean needs amounting to

2,853.6 units per 1,000.

Income, again, accounted for the eighth split on small-sized households with less than 5 members (Group 12). Households which had yearly incomes less than LS 150 (Group 16) had more needs, amounting to 1,673.7 units per 1,000, than those which had yearly incomes LS 150 or more (Group 17) with mean needs amounting to 854.1 units per 1,000.

The quality of house structure accounted for the ninth split on households where at least one member was 40 years and above (Group 11). Households living in houses made of thatch or reeds (Group 18) had more needs, amounting to 1,959.3 units per 1,000, than those living in houses made of materials other than thatch or reeds (Group 19) with mean needs amounting to 1,272.1 units per 1,000.

The sub-region accounted for the tenth split on large-sized households of 5 members or more (Group 13). Households in either South Blue Nile or White Nile sub-regions (Group 20) had less needs, amounting to 502.6 units per 1,000, than those in North Blue Nile sub-region (Group 21) with mean needs amounting to 824.2 units per 1,000.

The sub-region again accounted for the eleventh split on low income households of less than LS 150 yearly incomes (Group 16). Households in the White Nile sub-region (Group 22) had less needs, amounting to 1,010.7 units per 1,000, than those in either North Blue Nile or South Blue Nile sub-regions (Group 23) with mean needs amounting to 2,288.1 units per 1,000.

Rubbish collection accounted for the twelfth split on households in North Blue Nile sub-region (Group 21). Households residing in settlements where there had been regular rubbish collection (Group 24) had less needs, amounting to 573.7 units per 1,000, than those residing in settlements where there had been no regular rubbish collection (Group 25) with mean needs amounting to 1,293.9 units per 1,000.

Income, for the third time, accounted for the thirteenth split on households in rural non-farm settlements (Group 8). Households with low yearly incomes of LS 50 - 149 (Group 26) had more needs, amounting to 1,491.1 units per 1,000, than those with high yearly incomes of LS 150 or more (Group 27) with mean needs amounting to 827.9 units per 1,000.

The size of household again accounted for the fourteenth and last split on high income households with LS 150 yearly incomes or more (Group 17). Small-sized households of one or two members (Group 28) had more needs, amounting to 1,255.6 units per 1,000, than large-sized households of four or five members (Group 29) with mean needs amounting to 704.8 units per 1,000.

This tree illustrated different interaction effects to those illustrated with respect to need for primary care. The primacy of mass inoculation as a predictor of need was illustrated by the first split in both trees; i.e. that representing primary care and that representing intermediate care. Only the household income predictor was used three times in this tree. Both household size and sub-region predictors were each used twice. The rest of the predictors were each used once. In general, households in settlements with mass inoculation, those in settlements with rubbish collection, and house spraying, those in rural non-farm settlements, those in White Nile, those with many household members, those with high incomes, those living in houses of more durable materials, those where at least one member was 40 years and above, those where there were few members in the age group 17 years and below, were shown to have lower needs for intermediate care than the rest of the households. Specifically, the size had no bearing on households where there was no mass inoculation. On the other hand, age structure had no bearing on those households where there was mass inoculation. Also there were no sub-regional variations in need for intermediate care in settlements without mass inoculation. Rubbish collection was of importance in some households where there was mass inoculation in the settlement. House quality was only important to some households provided that no mass inoculation was carried out. Table 8 - 8 gives a summary of the characteristics of the final groups in the analysis. The table shows that 44.5% of the households in the region had needs for intermediate care above the average, while 55.4% of the households were below the average. 12.6% of the households were shown to have particularly high needs - exceeding 2,288 units per 1,000. (Groups 15, 4 and 23.) On the other hand, 35.1% of the households were shown to have quite low needs - below 574 units per 1,000 (Groups 20 and 24).

The degree of precision in predicting need for intermediate care with the ten selected predictors was reflected by the low proportion of unexplained variance in most final groups. With the exception of Groups 4 and 15 where the unexplained variance was rather high (i.e. 27.7% and 10.8% respectively), each of the remaining final groups had a low unexplained variance (i.e. within the range of 1.5% to 6.4%).

TABLE 8 - 8

CHARACTERISTICS OF FINAL GROUPS IN ANALYSIS OF NEED FOR INTERMEDIATE CARE.

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
15	36	3.9	2 853.6	0.108	No mass inoculation; Income $\geq$ LS 50 or more; No house spraying; In rural farm; No member 40 years and above; Age group 17 and below $\geq$ 55% or more.
4	50	5.4	2 566.8	0.277	No mass inoculation; Income $<$ LS 50.
23	45	3.3	2 288.1	0.064	Mass inoculation; Size $<$ 5 persons; Income $<$ LS 150; In North and South Blue Nile.

TABLE 8 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
18	44	4.7	1 959.3	0.062	No mass inoculation; Income $\geq$ LS 50 or more; No house spraying; In rural farm; At least one member 40 years and above; House built of thatch.
14	35	3.8	1 660.6	0.030	No mass inoculation; Income $\geq$ LS 50 or more; No house spraying; In rural farm; No member 40 years and above; 17 years and below $<$ 55%.
26	37	4.0	1 491.1	0.034	No mass inoculation; Income $\geq$ LS 50 $\leq$ 149; No house spraying; In rural non-farm.

TABLE 8 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
25	59	6.3	1 293.9	0.052	Mass inoculation; Size $\geq$ 5 persons or more; In North Blue Nile; No rubbish collection.
19	96	10.4	1 272.1	0.055	No mass inoculation; Income $\geq$ LS 50 or more; No house spraying; In rural farm; At least one member 40 years or more; House built of other than thatch or reed.
28	48	2.7	1 255.6	0.018	Mass inoculation; Size = 1 or 2 persons; Income $\geq$ LS 150 or more.

TABLE 8 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
22	35	3.1	1 010.7	0.020	Mass inoculation; Size $<$ 5 persons; Income $<$ LS 150; In White Nile.
27	49	5.3	827.9	0.015	No mass inoculation; Income $\geq$ LS 150 or more; No house spraying; In rural non-farm.
6	42	4.5	788.5	0.015	No mass inoculation; Income $\geq$ LS 150 or more; House spraying.
29	135	7.4	704.8	0.016	Mass inoculation; Size=3 or 4 persons; Income $\geq$ LS 150 or more.

TABLE 8 - 8

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
24	343	11.9	573.7	0.019	Mass inoculation; Size $\geq$ 5 persons or more; In North Blue Nile; Rubbish collection.
20	412	23.2	502.6	0.034	Mass inoculation; Size $\geq$ 5 persons or more; In South Blue Nile or White Nile.

Mean for all households in region = 1 136.7 units/1000 population.

x Total does not add up to 100% because of rounding up.

(1) Unexplained variance in Group refers to the variance within the group still not accounted for as a proportion of the total unexplained variance in the whole sample; i.e. $(TSS)_i/(TSS)_T$ gives the proportion for Group (i).

8.3.0 NEED FOR SECONDARY CARE

A household's need for secondary care has been defined as the extent of a household's need in a year for a higher quality of medical diagnosis and treatment than those which can be provided either by a dressing station or a dispensary or Class B or C hospitals. Such quality of care is assumed to be attained in the highest type of curative institutions in the region, i.e. Class A hospitals. The main objective in such institutions is seen as the effective reduction of mortality by disease in the region.

8.3.1 Correlation Analysis of Need for Secondary Care

I. Method

Simple correlations are carried out in order to discover the strength and direction of association between need for secondary care and the various sub-components of the need model. Such correlation will only show monotonic relationship between this type of need and the sub-components under assumptions of linearity and additivity.

II. Findings

The results of correlation analysis are given in Table 8 - 9. With the exception of a few cases, the table shows that a significant relationship existed between this type of need and each sub-component of the model. As expected, the highest correlation coefficients belonged to the sub-components of the macro-environmental component. Among these, the mass

TABLE 8 -9

CORRELATION OF EXPLANATORY VARIABLES WITH NEED FOR SECONDARY CARE.

Independent Variable			Correlation Coefficient
Component	Identification No.	Sub-components	
Demographic composition	i	Household size	-.187
	ii	Household sex composition (% males)	-.022 ×
		Household age structure:-	
	iii	% 1 year and below	.014 ×
	iv	% 5 years and below	-.020 ×
	v	% 17 years and below	-.072
	vi	% 40 years and above	-.102
	vii	% 50 years and above	.013 ×
	viii	% Females at child-bearing age	.080
Socio-economic structure	ix	Household income	-.162
	x	Occupation of Head	-.046
		Household level of awareness:-	
	xi	Educational level of Head	-.090
	xii	Educational level of Mother	-.060
	xiii	Educational level of Oldest	.049
	xiv	% children at school	-.143
Micro-environmental condition	xv	Room occupancy	.007 ×
		Household facilities:-	
	xvi	W.C. or latrine	-.174
	xvii	Bathroom	-.159
	xviii	Kitchen	-.061
	xix	Food storage	-.120
	xx	Water tap inside	-.199
	xxi	House sanitation (proper drainage)	-.141
	xxii	House cleanliness (absence of animals)	.104
	xxiii	Quality of house structure	-.146
Macro-environmental setting	xxiv	Sub-region (Ranked)	-.078
	xxv	Residence (Ranked)	-.231
		Curative environment:-	
	xxvi	General curative facilities	-.256
	xxvii	Health centre or Maternity Clinic	-.206

TABLE 8 - 9

..CONTINUED

Independent Variable			Corre-lation Coeffi-cient
Component	Identi-fication No.	Sub-components	
Macro-environ-mental setting	xxviii	Special non-general hospital	-.105
	xxix	Private clinic	-.219
	xxx	Drugstore	-.170
	xxxi	Local healer (Osteopath)	-.181
		Public and Preventive Health Environment:-	
	xxxii	Regular rubbish collection	-.231
	xxxiii	Regular street cleaning	-.244
	xxxiv	Adequate rain water disposal	-.216
	xxxv	Regular stagnant water treat-ment	-.180
	xxxvi	Piped drinking water system	-.201
	xxxvii	Regular house health inspec-tion	-.242
	xxxviii	Regular house spraying or fumigation	-.229
	xxxix	Programmes for malaria eradi-cation	-.161
	xL	Programmes for mass inocula-tion	-.289
		Social welfare environment:-	
	xLi	Regular adult education - males	-.179
	xLii	Regular adult education - females	-.172
	xLiii	Regular health education	-.152
	xLiv	Regular cookery or dietary instructions	-.172
	xLv	Regular embroidery or artisan classes	-.157
	xLvi	Regular visits by health visitor	-.207

x Not significant at the .01 level.

- Negative association.

inoculation predictor was found to be the most closely associated with this type of need. Households which resided in settlements where mass inoculation had been carried out, tended to have lower needs for secondary care, than those without mass inoculation. Other predictors within the macro-environmental component like general curative facilities, regular street cleaning, regular house health inspection, regular rubbish collection, residence and regular house spraying or fumigation, tended to be highly associated too with this type of need. Generally, households where higher levels of curative institutions existed, where regular street cleaning was available, where there was regular rubbish collection, where there was regular house health inspection and where there was regular house spraying or fumigation, tended to have lower needs than those where such facilities did not exist. Moreover, households in more urbanized settlements were shown to have less need for secondary care than those in less urbanized areas. All the remaining predictors within this component were shown to have comparatively high association with this type of need. These predictors are probably highly intercorrelated, and a high association of need with any of them, would automatically lead to high association with all the others without necessarily indicating any causal relationship.

The table also shows that the micro-environmental component, especially in relation to predictors describing the availability of a water tap inside the house and w.c. or latrine, was second in magnitude of correlation. Households where such facilities were available tended to have less need for secondary care than those without them. Other predictors within this component - those describing the availability of a bathroom, the availability of food storage, the quality of house structure, the house sanitation and house cleanliness - were shown to be significantly associated with this type of need. Households having bathrooms, food storage places and those living in houses of more permanent structures, those having proper house sanitation and those maintaining clean house environments were shown to have less need for secondary care than those without these facilities. The predictor describing kitchen availability was shown to be significant even though the magnitude of correlation was rather low. The predictor of room occupancy was shown to be insignificantly associated with this type of need.

The table also shows that the demographic composition component, especially in relation to household size, was next to the micro-environmental component in magnitude of correlation. Large-sized households were shown to have less need for secondary care than small-sized households. The predictors describing age groups 40 years and above, 17 years and below and females at child-bearing age were also shown to have significant association with this type of need even though the magnitudes of the correlation coefficients were small. Generally, households where there were high percentages of members in the age group 40 years and above and those that have high percentages of members in the age group 17 years and below, tended to have lower needs for secondary care than those with low percentages in either age group. On the other hand, households where the percentages of females at child-bearing age were low tended to have lower needs than those where such percentages were high, indicating that females at the child-bearing age had higher needs for secondary care than other females (the very young and the very old). The predictors describing the sex composition and the other age groups did not show any significant relationships with this type of need.

The table also shows that the socio-economic component was the least associated with need for secondary care. The highest correlation coefficient within this component was shown to be less than any high correlation coefficient in any of the other components. Among predictors in this component, that describing household income had the closest association with this type of need. Households with high incomes were shown to have less need for secondary care than those with low incomes. The predictor indicating the percentage of children at school was also shown to be significantly associated with this type of need. Households where the percentage of children at school were high, tended to have less need for secondary care than those where such a percentage was low. But generally the other predictors describing the occupational status of main earner and the level of awareness were shown to have comparatively low associations with this type of need. While households with highly educated heads or mothers were shown to have less need for this type of care than those with low educated heads or mothers, those with highly educated oldest members tended to have higher needs than those with low educated oldest members.

In sum, Table 8 - 9 shows that with a few exceptions, households differ in their needs for secondary care for reasons similar to those indicated in the case of the two previous needs. The A.I.D. analysis which follows will help to clarify the nature of these relationships more than has so far been indicated.

8.3.2 A.I.D. Analysis of Need for Secondary Care

I. Method

The dependent variable in this case is the household's need for secondary curative care as calculated for each household from the survey results together with the weighting factors proposed in Chapter 7 (refer to Table 7 - 2 for weights). The potential predictors in this case, like in the two previous cases, are all the 46 indices describing the four main components of the need model, i.e. household demographic composition, household socio-economic structure, household micro-environmental condition and household macro-environmental setting.

II. Findings

Table 8 - 10 shows that, of the 46 possible predictors of need included in this A.I.D. run, only 14 were actually used in the analysis.(1) These were selected through the analysis

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(1) Detailed information on the selection of these predictors is summarized in Table B - 4, Appendix B.

TABLE 8 - 10

VARIANCE EXPLAINED IN A.I.D. ANALYSIS OF NEED FOR SECONDARY CARE.

Identi-fica-tion No.	Predictor	Variance Explained
	Demographic Composition	.070
i	Household size	.025
ii	Household sex composition (% males)	.002
v	% age group 17 years and below	.009
vi	% age group 40 years and above	.028
viii	% females at child-bearing age	.006
	Socio-economic structure	.013
ix	Household income	.011
x	Occupation of main earner	.002
	Micro-environmental condition	.020
xviii	Kitchen	.019
xxii	House cleanliness (absence of animals)	.001
	Macro-environmental setting	.120
XXIV	Sub-region	.024
xxv	Residence	.015
xxxii	Regular rubbish collection	.021
xL	Programmes for mass inoculation	.058
xLii	Regular adult education for females	.002
	R^2 (Total)	.223

as best predictors of need for secondary care. The other thirty-two which were not used in the analysis were shown to have no significant causal relationship with this type of need. This indicates that the unused predictors which were shown to have high correlation coefficients in the earlier analysis were merely associated with this type of need, because of inter-correlation with those predictors that were found to be significant. The results shown on Table 8 - 10 support the first two general hypotheses with regard to this type of need as well. The demographic composition, the socio-economic, the micro-environmental and the macro-environmental components were shown to contribute independently to the explanation of the differences in need for secondary care. The proportion of variance explained by each component was shown to be different. The macro-environmental component accounted for the largest proportion of explained variance (0.120). It should be noted that the macro-environmental component in this case accounted for more of the explained variance than in the case of either primary care need (0.114) or intermediate care need (0.103). Contrary to the results of the earlier correlation, the demographic composition component was shown to be next in importance to the macro-environmental component (0.070). It should be noted that the proportion of variance accounted for by this component in this case was higher than in the case of intermediate care need (0.036) but lower than in the case of primary care need (0.086). The micro-environmental component was shown to be third in importance in relation to this type of need (0.020). It should also be noted that the proportion of variance attributed to this component in this case was higher than in the case of intermediate care need (0.006) and lower than in the case of primary care need (0.028). The socio-economic component was shown to be the least in importance in relation to this type of need (0.013). The proportion of variance attributed to this component in this case was also less than either in the case of intermediate care need (0.035) or in the case of primary care need (0.018). These findings indicated that in order to reduce need for secondary care effectively more positive attention should be paid primarily to macro-environmental condition. Secondly, special attention should be paid to the demographic composition of the households. Thirdly, attention should be paid to the micro-environmental condition of the households and fourthly, to the socio-economic condition of the households.

Among the variables representing the macro-environmental component, mass inoculation had the greatest single influence on this type of need as indicated by the proportion of variance attributed to it (0.058). Within this component, the sub-regional variable had the next high influence on this type of need (0.024). Within this component, only rubbish collection among all the other public health measures was shown to have significant influence on this type of need. Rubbish collection assumed a third place in importance within this component (0.021). Residence was fourth in importance (0.015) and social welfare environment as represented by female adult education was fifth and last in importance (0.002).

Curative environment was not represented and therefore it had no influence on this type of need.

Among variables describing the demographic composition, the age group 40 years and above was most influential on this type of need (0.028) despite indications in the earlier correlation analysis of the higher status of household size. However, household size was found to be second in importance within this category of variables (0.025). The variables representing age group 17 years and below and percentage of females at child-bearing age were shown to be third and fourth in importance within this category (0.009, 0.006 respectively). Contrary to the earlier correlation analysis, sex composition was shown to have some limited influence on this type of need (0.002). Variables representing age groups 5 years and below and 50 years and above were shown to have no significant influence on this type of need.

Among variables describing the micro-environmental component, the variable describing the kitchen availability was shown to be the most important (0.019). None of the other variables representing the house facilities was shown to have significant influence on this type of need. House cleanliness was shown to have only limited influence on this type of need (0.001). Neither room occupancy nor house sanitation nor the quality of the house structure indicated any significant influence. The comparatively high magnitude of correlation of the unused variables within this category could have been merely the result of high intercorrelation with other important variables.

Among the variables describing the socio-economic component only household income and occupation of main earner were shown to influence need for secondary care. Income had a higher influence (0.011) on this type of need than occupation of main earner (0.002). None of the variables representing the household level of awareness was shown to have significant influence.

III. The Relative Importance of the Components

Table 8 - 10 indicated the absolute importance of the variables as well as the main components of the model. In order to see more clearly the relative importance of the main components and their respective sub-components, Table 8 - 11 is presented. The table summarizes the A.I.D. findings by expressing them as the percentage of explained variance attributed to each component and its respective sub-components. An examination of Table 8 - 11 shows that the macro-environmental component accounted for 53.8% of the explained variance in this type of need. This is a higher percentage than it accounted for in the case of primary care need (46.3%), and a lower percentage than in the case of intermediate care need (57.3%). The demographic composition accounted for 31.4% of the explained variance in this type of need. This percentage is higher than that which the component had in relation to intermediate care need (20%) but lower than it had in the case of primary care need (35%). The micro-environmental component accounted for 9% of the explained variance. This represents a higher percentage than it accounted for in the case of intermediate care need (3.3%),

TABLE 8 - 11

PER CENT OF EXPLAINED VARIANCE IN NEED FOR SECONDARY CARE ATTRIBUTED TO MAIN COMPONENTS AND SUB-COMPONENTS.

Sub-components	Per cent of Total explained variance
Demographic composition	31.4
Household size	11.2
Household sex composition	0.9
Household age structure	19.3
Socio-economic structure	5.8
Household income	4.9
Occupation of main earner	0.9
Household level of awareness	0.0
Micro-environmental condition	9.0
Room occupancy	0.0
Household facilities	8.5
House sanitation	0.0
House cleanliness	0.5
Quality of house structure	0.0
Macro-environmental setting	53.8
Sub-region	10.8
Residence	6.7
Curative environment	0.0
Public and Preventive Health Environment	35.4
Social welfare environment	0.9
Total	100.0

but a lower one than in the case of primary care need (11.4%). The socio-economic component accounted for 5.8% of the explained variance. This represents a lower percentage than that which the component had accounted for in relation to either primary care need (7.3%) or intermediate care need (19.4%).

Among all the sub-components of the model, the public and preventive health sub-component was shown to have the highest relative importance in relation to need for secondary care. Its relative importance to this type of need (35.4%) was shown to be greater than its relative importance to primary care need (32.1%), but lower than its relative importance to intermediate care need (43.9%).

The household age structure sub-component was shown to be the one next in relative importance in relation to this type of need (19.3%). Its relative importance to this type of need was greater than its relative importance to either primary care need (14.3%) or intermediate care need (12.2%).

The household size sub-component was shown to be third in relative importance in relation to this type of need (11.2%). This represents a greater influence on this type of need than it had on need for intermediate care (7.8%), but a lower influence than it had on need for primary care (13%).

The sub-regional sub-component was shown to be fourth in relative importance in relation to this type of need (10.8%). This represented a greater influence on this type of need than it had on either need for primary care (8.2%) or need for intermediate care (7.8%).

The household facilities sub-component was shown to be fifth in relative importance in relation to this type of need (8.5%). This represented almost a similar influence on this type of need to the one it had on need for primary care (8.2%).

The residential sub-component was shown to be sixth in relative importance in relation to this type of need (6.7%). This represented a slightly greater influence on this type of need than it had on either need for primary care (5.2%) or need for intermediate care (5.6%).

The household income sub-component was shown to be seventh in relative importance in relation to this type of need (4.9%). This represented a slightly greater influence on this type of need than it had on need for primary care (4.5%), but a much lower influence than it had on need for intermediate care (19.4%).

The sex composition, the occupation of head and the social welfare environment sub-components were shown to be eighth in relative importance. They all have similar influences on this type of need (0.9%). In the case of sex composition and occupation of head sub-components, this represented a lower influence on this type of need than the influence they had on need for primary care (7.7% and 2.8% respectively). In the case of the social welfare environmental sub-component, this represented almost a similar influence to the one it had on need for primary care (0.8%).

The house cleanliness sub-component was the last in relative importance in relation to this type of need (0.5%).

This represented a lower influence than it had on need for primary care (0.8%).

Sub-components like household level of awareness, room occupancy, house sanitation, quality of house structure and curative environment were shown to have no significant influence on need for secondary care.

It should be pointed out that these findings supported the third general hypothesis of the need model that the relative importance of each component (and its respective sub-components) will vary according to the type of need considered. These variations are largely due to the variations in the priority of the different disease categories.

IV. The Analytical Process

In order to understand how and why households in the region differ in their needs for secondary care (i.e. specialized hospital care), it is necessary to examine the prediction tree.

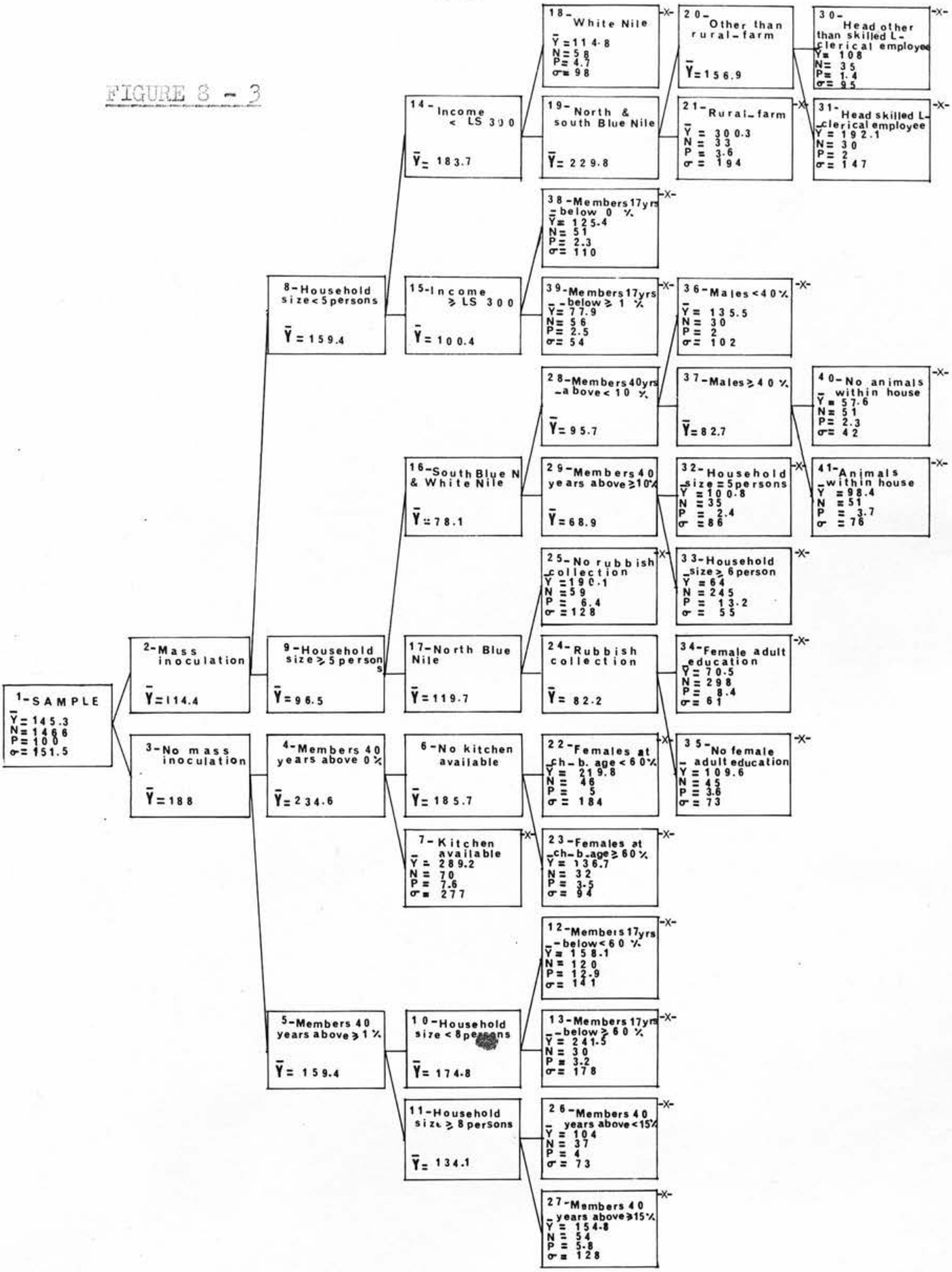
Figure 8 - 3 provides a more detailed view of the analysis of need for secondary care. Twenty splits are carried out during the A.I.D. analysis. The splits are ordered according to the unexplained variance they account for. The first group in the tree indicated the mean for all households in the region (145.3 units per 1,000 population). The rest of the tree showed which characteristics were able to separate the most needy households from those less in need of secondary care.

Mass inoculation provided the initial split. Households where mass inoculation was carried out (Group 2) had

FIGURE 8 - 3

PREDICTOR TREE FOR THE A.I.D. ANALYSIS OF NEED FOR SECONDARY CARE

FIGURE 8 - 3



(Ȳ) GROUP MEAN IN UNITS/1000 PERSONS
(N) NUMBER OF HOUSEHOLDS IN SAMPLE
(P) PERCENTAGE OF HOUSEHOLDS IN REGION
(σ) STANDARD DEVIATION
(-X-) FINAL GROUP

lower need for secondary care as indicated by their mean of 114.4 units per 1,000 than those where mass inoculation was not carried out (Group 3) with mean needs amounting to 188 units per 1,000.

The age group 40 years and above provided the second split on households without mass inoculation (Group 3). Households with no member 40 years and above (Group 4) had more needs, amounting to 234.6 units per 1,000, than those where at least one member was 40 years and above (Group 5) with mean needs amounting to 159.4 units per 1,000. This finding implies that older people of 40 years and above have lower needs for secondary care than younger people.

Kitchen availability provided the third split on households with no member 40 years and above (Group 4). Households with no kitchen in the house (Group 6) had less need of secondary care, amounting to 185.7 units per 1,000, than those with a kitchen in the house (Group 7) with mean need amounting to 289.2 units per 1,000.

Household size provided the fourth split on households where mass inoculation had been carried out (Group 2). Small-sized households of less than 5 persons (Group 8) had more need of secondary care, amounting to 159.4 units per 1,000, than large-sized households of 5 persons or more (Group 9) with mean need amounting to 96.5 units per 1,000.

Household size again provided the fifth split on households where at least one member was 40 years and above (Group 5). Small-sized households of less than 8 persons (Group 10) had more need of secondary care, amounting to 174.8 units per 1,000, than large-sized households of 8 persons or more (Group 11) with mean need amounting to 134.1 units per 1,000.

The age group 17 years and below provided the sixth split on small-sized households of less than 8 persons (Group 10). Households where members of 17 years and below constituted less than 60% (Group 12) had less need of secondary care, amounting to 158.1 units per 1,000, than those where members of 17 years and below constituted 60% or more (Group 13) with mean need amounting to 241.5 units per 1,000. This finding implied that younger people of 17 years and below had more need of secondary care than older people above that age.

Household income provided the seventh split on small-sized households of less than 5 persons (Group 8). Households with yearly incomes of less than LS 300 (Group 14) had more need of secondary care, amounting to 183.7 units per 1,000, than those with yearly incomes of LS 300 or more (Group 15) with mean need amounting to 100.4 units per 1,000.

The sub-region provided the eighth split on large-sized households of 5 persons or more (Group 9). Households in South Blue Nile or White Nile sub-regions (Group 16) had less need of secondary care, amounting to 78.1 units per 1,000, than those in North Blue Nile sub-region (Group 17) with mean need amounting to 119.7 units per 1,000.

The sub-region, again, provided the ninth split on low income households of less than LS 300 (Group 14). Households in White Nile sub-region (Group 18) had less need of secondary care, amounting to 114.8 units per 1,000, than those in either North or South Blue Nile sub-regions (Group 19) with mean need amounting to 229.8 units per 1,000.

Residence provided the tenth split on households in North or South Blue Nile (Group 19). Households in settlements other than rural farm (Group 20) had less need of secondary care, amounting to 156.9 units per 1,000, than those in rural farm settlements (Group 21) with mean need amounting to 300.3 units per 1,000.

The percentage of females at child-bearing age provided the eleventh split on households without kitchens (Group 6). Households where females at child-bearing age constituted less than 60% (Group 22) had more need of secondary care, amounting to 219.8 units per 1,000, than those where females at this age constituted 60% or more (Group 23) with mean need amounting to 136.7 units per 1,000.

Rubbish collection provided the twelfth split on households in North Blue Nile (Group 17). Households where there was regular rubbish collection (Group 24) had less need of secondary care, amounting to 82.2 units per 1,000, than those where there was no regular rubbish collection (Group 25) with need amounting to 190.1 units per 1,000.

The age group 40 years and above again provided the thirteenth split on large-sized households of 8 persons or more (Group 11). Households where members 40 years and above constituted 1 - 14.99% (Group 26) had less need of secondary care, amounting to 104 units per 1,000, than those where such members constituted 15% or more (Group 27) with mean need amounting to 154.8 units per 1,000. This finding implied that in this particular case older people of 40 years and above had greater need of secondary care than younger people.

The age group 40 years and above also provided the fourteenth split on households in South Blue Nile or White Nile (Group 16). Households where members 40 years and above constituted less than 10% (Group 28) had more need of secondary care, amounting to 95.7 units per 1,000, than those where such members constituted 10% or more (Group 29) with mean need amounting to 68.9 units per 1,000. This finding implied that, contrary to the previous finding, older people of 40 years and above had less need of secondary care than younger people.

The occupation of the main earner provided the fifteenth split on households residing in settlements other than rural farm (Group 20). Households where main earners were neither skilled labourers nor clerical employees (Group 30) had less need of secondary care, amounting to 108 units per 1,000, than those where the main earners were either skilled labourers or clerical employees (Group 31) with mean need amounting to 192.1 units per 1,000.

Household size provided the sixteenth split on households where members 40 years and above constituted 10% or more (Group 29). Households with a size of only 5 members (Group 32) had more need of secondary care, amounting to 100.8 units per 1,000, than those with sizes of 6 persons or more (Group 33) with mean need amounting to 64 units per 1,000.

Female adult education provided the seventeenth split on households where there was regular rubbish collection (Group 24). Households where there was regular female adult education (Group 34) had less need of secondary care, amounting to 70.5 units per 1,000, than those where there was no regular female adult education (Group 35) with mean need amounting to 109.6 units per 1,000.

Sex composition provided the eighteenth split on households where members 40 years and above constituted less than 10% (Group 28). Households where males constituted less than 40% (Group 36) had more need of secondary care, amounting to 135.5 units per 1,000, than those where males constituted 40% or more (Group 37) with mean need amounting to 82.7 units per 1,000. This finding inplied that, in this particular case, females had greater need of secondary care than males. This finding confirmed the earlier assumption that females had more need for medical care than males.

The age group 17 years and below again provided the nineteenth split on high income households with yearly incomes of LS 300 or more (Group 15). Households where there was no member 17 years or below (Group 38) had more need of secondary care, amounting to 125.4 units per 1,000, than those where at least one member was 17 years and below (Group 39) with mean need amounting to 77.9 units per 1,000. This finding, contrary to the previous finding on this age group, implied that younger people of 17 years and below had less need of secondary care than older people above that age.

House cleanliness provided the twentieth and last split on households where males constituted 40% or more (Group 37). Households where there was adequate house cleanliness as implied by lack of loose animals within the house compound (Group 40) had less need of secondary care, amounting to 57.6 units per 1,000, than those where there was no adequate house cleanliness (Group 41) with mean need amounting to 98.4 units per 1,000.

This tree illustrated different interaction effects from those illustrated by the two previous trees describing the variations in primary and intermediate need for care, although the importance of mass inoculation as a major predictor of all types of need was also confirmed in this analysis. Age group 40 years and above and the household size predictors were each used three times in this analysis. Age group 17 years and below and sub-region were each used twice in the analysis. The rest of the significant predictors were each used only once. In general households in settlements with mass inoculation, those with larger number of members, those with higher incomes, those in South Blue Nile or White Nile areas, those where there was a higher percentage of males, those living in more urbanized areas, those where there was regular rubbish collection, those where there was regular female adult education, those where there were high percentages of females at child-bearing age and those where there was adequate house cleanliness, were shown to have lower needs for secondary care than the rest of the households. Age structure, on the other hand, was shown to have two contradicting effects. On certain occasions, people in the higher age groups (i.e. 40 years and above) or people in the lower age groups (i.e. 17 years and below) were shown to have less need than those in other age groups, while on other occasions the contrary was shown. This particular case demonstrated the ability of the A.I.D. analysis to isolate such contradicting effects which the earlier correlation analysis was unable to reflect. Other interaction effects which the earlier correlation analysis failed to detect were those related to sex composition and kitchen availability. The earlier correlation analysis showed that sex composition had an insignificant association with need for secondary care. However, the A.I.D. analysis demonstrated that sex composition was significant enough to emerge as a selected predictor when many others which appeared to be much more significant in the correlation analysis did not appear in the A.I.D. analysis. Again, in the correlation analysis, the kitchen availability variable had the lowest association with need of all the variables within micro-environmental component, yet in the A.I.D. analysis it was shown to be the most significant of all the variables in this component. Not only that but the A.I.D. demonstrated that the direction of the relationship between availability of kitchen and need for secondary care was a positive one, contrary to the negative association shown on the correlation analysis.

The tree clearly illustrated the non-uniformity of the impact of the different sub-components of the need model on the households in the region. Table 8 - 12 gives a summary of the final groups which can reflect this non-uniformity of impact more clearly. This table also shows that about 46% of the households in the region had a need for secondary care above the average while 54% of the households were below the average. About 14.4% of the households were shown to have particularly high need above 241 units per 1,000 (Groups 21, 7 and 13), while about 15.5% of the households were shown to have particularly low need below 64 units per 1,000 (Groups 33 and 40).

The degree of precision in predicting need for secondary care with the fourteen selected predictors was reflected by the low proportion of unexplained variance still remaining in each of the final groups. With the exception of Groups 7 and 12 where the remaining unexplained variance was high (25.3% and 11.2% respectively) each of the remaining final groups had a low unexplained variance (within the range of 0.2% to 7.3%).

TABLE 8 - 12

CHARACTERISTICS OF FINAL GROUPS IN ANALYSIS OF NEED FOR SECONDARY CARE.

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
21	33	3.6	300.3	0.059	Mass inoculation; Size $<$ 5 persons; Income $<$ LS 300; In North Blue Nile; In rural farm settlements.
7	70	7.6	289.2	0.253	No mass inoculation; No member 40 years and above; Kitchen in house.
13	30	3.2	241.5	0.045	No mass inoculation; At least one member 40 years and above; Size $<$ 8 persons; 17 years and below $\geq$ 60%.

TABLE 8 - 12

...CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
22	46	5.0	219.8	0.073	No mass inoculation; No member 40 years and above; No kitchen in house; Women at child-bearing age < 60%.
31	30	2.0	192.1	0.019	Mass inoculation; Size < 5 persons; Income < LS 300; In North or South Blue Nile; In other than rural farm; Occupation of Head: Other than skilled labourer or clerical.
25	59	6.4	190.1	0.045	Mass inoculation; Size ≥ 5 persons; In North Blue Nile; No rubbish collection.

TABLE 8 - 12

...CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
12	120	12.9	158.1	0.112	No mass inoculation; At least one member 40 years and above; Size $<$ 8 persons; 17 years and below $<$ 60%.
27	54	5.8	154.8	0.042	No mass inoculation; 40 years and above $\geq$ 15%; Size $\geq$ 8 persons.
23	32	3.5	136.7	0.013	No mass inoculation; No member 40 years and above; No kitchen in house; Women at child-bearing age $\geq$ 60%.
36	30	2.0	135.5	0.009	Mass inoculation; Size $\geq$ 5 persons; In South Blue Nile or White Nile; 40 years and above $<$ 10%; Males $<$ 40%.

TABLE 8 - 12

...CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
38	51	2.3	125.4	0.012	Mass inoculation; Size $<$ 5 persons; Income $\geq$ LS 300; No member 17 years and below.
18	58	4.7	114.8	0.020	Mass inoculation; Size $<$ 5 persons; Income $<$ LS 300; In White Nile.
35	45	3.6	109.6	0.008	Mass inoculation; Size $\geq$ 5 persons; In North Blue Nile; Rubbish collection; No adult education for females.

TABLE 8 - 12

...CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
30	35	1.4	108.0	0.006	Mass inoculation; Size < 5 persons; Income < LS 300; In North or South Blue Nile; In other than rural farm; Occupation of Head: Other than skilled labourer or clerical employee.
26	37	4.0	104.0	0.009	No mass inoculation; 40 years and above $> \alpha < 15\%$; Size $\geq$ 8 persons.
32	35	2.4	100.8	0.007	Mass inoculation; Size only 5 persons; In South Blue Nile or White Nile; 40 years and above $\geq$ 10%.

TABLE 8 - 12

...CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) ×	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
41	51	3.7	98.4	0.009	Mass inoculation; Size $\geq$ 5 persons; In South Blue Nile or White Nile; 40 years and above $<$ 10%; Males $\geq$ 40%; No cleanliness in house.
39	56	2.5	77.9	0.003	Mass inoculation; Size $<$ 5 persons; Income $\geq$ LS 300; At least one member 17 years and below.
34	298	8.4	70.5	0.014	Mass inoculation; Size $\geq$ 5 persons; In North Blue Nile; Rubbish collection; Adult education for females.

TABLE 8 - 12

...CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean Primary Care Need/ 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
33	245	13.2	64.0	0.017	Mass inoculation; Size $\geq$ 6 persons; In South Blue Nile or White Nile; 40 years and above $\geq$ 10%.
40	51	2.3	57.6	0.002	Mass inoculation; Size $\geq$ 5 persons; In South Blue Nile or White Nile; 40 years and above $<$ 10%; Males $\geq$ 40%; Cleanliness in house.

Mean for all households in region = 145.3 units/1000.

x Total does not add up to 100% because of rounding up.

(1) Unexplained variance in Group refers to the variance within the Group still not accounted for as a proportion of the total unexplained variance in the whole sample; i.e. $(TSS)_i/(TSS)_T$ gives the proportion for Group (i).

8.4.0 SUMMARY OF NEED ANALYSIS

In this chapter households' needs for primary, intermediate and secondary curative care were studied separately, because they are major segments of the total volume of need. Since the nature, extent and cost of medical resources required to satisfy each type of need are different, an examination of the factors that influence each is considered to be an essential ingredient of a rational planning process. The foregoing analyses have shown that household characteristics associated with each type of need were to a large extent different. Table 8 - 13 summarizing these analyses illustrates these differences.

The first hypothesis of this study - that the extent of a household's need for either primary, intermediate or secondary curative care is a function of the household's demographic composition, its socio-economic structure, its micro-environmental condition and its macro-environmental setting - was generally supported. The correlation analysis in each case showed significant relationships between variables representing each component and need. Further, in the A.I.D. analysis of each case (Table 8 - 13) which attempted to take into account causal relationship, each component was able to account for some variation in needs.

The second hypothesis is - that in each case the explanatory components will vary in their contribution to the total explanation - also received support. In each case the

TABLE 8 - 13

VARIANCE EXPLAINED BY EACH COMPONENT (AND SUB-COMPONENT) FOR EACH TYPE OF NEED.

Components	Proportion of Total Variance in Need Explained		
	Type of Need		
	Need for Primary Care	Need for Intermediate Care	Need for Secondary Care
Demographic composition	.086	.036	.070
Household size	.032	.014	.025
Household sex composition	.019	-	.002
Household age structure	.035	.022	.043
Socio-economic structure	.018	.035	.013
Household income	.011	.035	.011
Occupation of main earner	.007	-	.002
Household level of awareness	-	-	-
Micro-environmental condition	.028	.006	.020
Room occupancy	.003	-	-
Household facilities	.020	-	.019
House sanitation	.003	-	-
House cleanliness	.002	-	.001
Quality of house structure	-	.006	-
Macro-environmental setting	.114	.103	.120
Sub-region	.020	.014	.024
Residence	.013	.010	.015
Curative environment	-	-	-
Public and Preventive Health environment	.079	.079	.079
Social welfare environment	.002	-	.002
Total (R^2)	.246	.180	.223

components accounted for a different proportion of the variance explained. The macro-environmental component in each case was shown to have the strongest influence on need. The importance of the macro-environmental component was reflected by both the correlation and the A.I.D. analyses in each case.

The findings suggested specifications of the relationships between the explanatory components of the model and various types of need for curative care beyond those stated in the original hypotheses. Within each component the most important sub-components and even indices were revealed in each case. For example, within the macro-environmental component, the public and preventive health sub-component was shown to be consistently the most important of all the sub-components. Further, within this sub-component, the index describing the availability of mass inoculation was shown to be consistently the most important of all the indices. Such specification adds more to the knowledge of why households' needs for various curative care are different.

The third hypothesis - that the relative importance of each component will vary according to the type of need considered - was also supported. The foregoing analyses have also shown the relative importance of each component varied from one type of need to another. Table 8 - 14 summarizing these, illustrates these differences in relative importance. Even though the proportion of variance explained by the macro-environmental component was shown to be the highest in the case of secondary care need, medium in the case of primary care need and lowest

TABLE 8 - 14

PER CENT OF EXPLAINED VARIANCE IN NEED ATTRIBUTED TO EACH COMPONENT (AND SUB-COMPONENT) FOR EACH TYPE OF NEED.

Components	Per cent of Total Explained Variance		
	Type of Need		
	Need for Primary Care	Need for Intermediate Care	Need for Secondary Care
Demographic composition	35.0	20.0	31.4
Household size	13.0	7.8	11.2
Household sex composition	7.7	-	0.9
Household age structure	14.3	12.2	19.3
Socio-economic structure	7.3	19.4	5.8
Household income	4.5	19.4	4.9
Occupation of main earner	2.8	-	0.9
Household level of awareness	-	-	-
Micro-environmental condition	11.4	3.3	9.0
Room occupancy	1.2	-	-
Household facilities	8.2	-	8.5
House sanitation	1.2	-	-
House cleanliness	0.8	-	0.5
Quality of house structure	-	3.3	-
Macro-environmental setting	46.3	57.3	53.8
Sub-region	8.2	7.8	10.8
Residence	5.2	5.6	6.7
Curative environment	-	-	-
Public and Preventive Health environment	32.1	43.9	35.4
Social welfare environment	0.8	-	0.9
Total per cent	100.0	100.0	100.0

in the case of intermediate care need (Table 8 - 13), Table 8 - 14, expressing the variance as percentages of the total in each case, shows that this component is in fact comparatively most important in the case of intermediate care accounting for 57.3% of the explained variance; medium in the case of secondary care accounting for 53.8% of the explained variance, and lowest in the case of primary care accounting for 46.3% of the explained variance. Further examination of the two summary tables (Tables 8 - 13 and 8 - 14) shows that the relative importance of the components and their respective sub-components does not depend only on the proportion of the variance explained, but rather on that proportion in relation to the total variance explained in each case.

The fourth hypothesis - that the overall ability of the model to explain need would vary from one type of curative care to the other - was also supported. The summary in Table 8 - 13 shows that, as expected, the total variance explained in the case of need for primary care was higher (0.246) than in either of the other cases (0.180 for intermediate care and 0.223 for secondary care). This is particularly so because this type of need represents all disease categories experienced by households, while the other types of need only represent partial needs. All components contributed substantially to the explanation of primary care need. In the case of intermediate care need, the micro-environmental component offered very little contribution to the explanation. And in the case of seçondary care, the socio-economic component subscribed a rather little contribution to the explanation. However, more of the total variance was explained for secondary care than for intermediate care. This is probably because of some bias connected with hospitalization decision. The decision to admit a patient to a hospital is influenced by many factors both inside and outside the hospital domain as had been discussed earlier in the text.

8.4.1 Explanatory Power of the Need Model

The general explanatory power of the need model in relation to all types of need was found to be rather lower than expected. Many factors may have contributed to this: First, the record of need was collected for only one year (i.e. the survey year). This automatically imposed a limitation on the scope of the study. If the need record had been collected for a number of years, the total variance in the sample $(TSS)_T$ would have been lowered and accordingly, the components would have probably been more able to account for more of the unexplained variance.

Secondly, the collection of data and particularly that concerning diseases relied on self-reporting rather than clinical investigation. Unfortunately, self-reporting cannot be expected to give a hundred per cent proof reliable answers. Answers are conditioned by peoples' memory of cases of illness experienced during a year. It is unlikely that many but the most severe ailments were remembered. Although attempts were made to encourage the sampled households to keep a diary sheet for all ailments experienced during the first and second phases of the survey (i.e. about 6 months), not many of the households were keen to fill in these diaries. However, if more frequent surveys of ailments had been made during the year, more of the less severe illnesses would have been reported, and the results would have probably led to a greater proportion of variance explained by the need model. If, on the other hand, clinical investigation instead of self-reporting had been conducted on the sample, the reliability of the need measure would have been maximized and probably more variance would have been explained by the components of the model. Even when people are quite keen to cooperate in giving reliable answers in such a survey as was the case in this survey, there are a few diseases which people are secretive about and will never like to disclose to the interviewers.

Thirdly, the need model does not include other than environmental factors in explanation of need. However, there are other factors, i.e. mainly individual hereditary factors which could account for variations in need. Other factors like individual adverse habits, i.e. smoking, excessive drinking, etc., could also account for variations in need. These were excluded from the model because of difficulty in assessing them. If such individual factors were included despite the difficulty of doing so, more would have been explained. It should be noted that the chosen unit of the model was the household and not the individual persons. In this choice, it was realized that individual influences would be sacrificed and would therefore not be accounted for. This admittedly imposed a limitation on the scope of this study.

Fourthly, the explanatory power of the model could have been increased if the size of the sample had been larger. Quite a few of the final groups of the analyses contained rather high proportions of unexplained variance (i.e. Group 10 in primary care need, Groups 4 and 15 in intermediate care need, and Groups 7 and 12 in secondary care need). During the A.I.D. analysis further splitting was stopped because at least one of the resulting groups would have contained very few households.(1) If more sample units were available (i.e. a large sample), more of the unexplained variance could have been accounted for. A larger sample could not have been conducted in view of the researcher's limited time and funds.

The next chapter will deal with the analysis of effective demand for curative facilities.

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(1) This is one of the conditions set out in the A.I.D. to avoid further splitting of small groups. See the A.I.D. algorithm and rules for stopping the splitting process in Appendix B.

PLANNING FOR AN OPTIMAL AND EQUITABLE REGIONAL DISTRIBUTION OF CURATIVE HEALTH FACILITIES, WITH SPECIAL REFERENCE TO THE BLUE NILE PROVINCE OF THE SUDAN.

CHAPTER 9

ANALYSIS OF DEMAND

CONTENTS Page

9.0.0 ANALYSIS OF DEMAND

This chapter is an analysis of the differences in the extent of households' demands for curative care institutions. It considers these differences within the framework of the demand model developed in Chapter 7. Specifically, the four main hypotheses related to the demand model are investigated here:-

Hypothesis I.

The extent of total demand a household makes for curative care facilities in a region will be a function of the predisposing need components and the enabling demographic, socio-economic, macro-environmental and physical accessibility characteristics. Each of the five components will make an independent contribution to the understanding of differences in demand for curative facilities.

Hypothesis II.

The explanatory components of the model will vary in their contribution to the explanation of total demand. Need will be more important than any of the other enabling components because it is the main reason for demanding curative care.

Hypothesis III.

The relative contribution of each component will vary according to the type of demand:-

1. The relative contribution of the predisposing component will be greatest in the case of demand for primary care institutions because these are most abundant and a household has least discretion in

choosing alternative institutions.

2. The relative contribution of the enabling components will be greatest in the case of demand for intermediate and secondary care institutions because these are fewer in number and there is a certain amount of household discretion involved in demanding each of them.
3. The relative contribution of the enabling physical accessibility component in particular will be greatest in the case of demand for secondary care institutions because these are least available in the region and most inaccessible to the bulk of the regional population.
4. The relative contribution of the socio-economic component will be least in all types of demand because all health services in the region are free of charge.

Hypothesis IV.

The overall success of the model in explaining differences in demand will vary slightly from one type of demand to another:-

1. It will best explain demand for primary care institutions because differences in this type of demand will be explained primarily by the predisposing need component.
2. It will have less success in demand for intermediate and secondary care institutions because differences

in these will be explained primarily by the discretionary enabling components.

The analysis in this chapter will be presented under three main headings, i.e. total demand for curative care facilities, demand for various types of curative care institutions and summary of demand analysis. Under the first heading, the first two hypotheses referring to total demand will be examined. The last two hypotheses referring to the various types of demand will be examined under the second heading. Under the third heading, the findings related to total demand and to demand for various levels of care will be summed up.

The methodological techniques in this chapter parallel those used in the analysis of need. Therefore, discussion of these mechanics is largely deleted from this chapter. Again, the investigation under each of the first two sections is divided into two parts using correlations and the A.I.D. analysis of variance technique.

9.1.0 TOTAL DEMAND FOR CURATIVE CARE FACILITIES

A household's total demand for curative care facilities refers to both quantitative and qualitative demands made by the household to the various curative institutions in the region during the survey year. The combination of both quantity and quality of demand was made possible by introducing a cost-equivalent unit for each type of visit as discussed in Chapter 7.

9.1.1 Correlation Analysis of Total Demand

In order to test the strength and direction of monotonic relationship between indices representing the five components of the model and total demand for curative care facilities, raw correlations are computed. The results of this correlation analysis are given in Table 9 - 1. It shows that under each component at least some indices are significantly associated with total demand. Under the predisposing need component, the enabling macro-environmental and physical accessibility components in particular all indices are significantly associated. The predisposing need component, represented by need for primary care, as expected, was most closely associated with demand (i.e. 0.303). Households with high need for primary care tended to have high total demand for curative care facilities. Accordingly, need was shown to be the best predictor of total demand.

The enabling macro-environmental component followed the predisposing need component in magnitude of correlation with total demand. The type of sub-region where the household had been located was the best predictor of total demand among the rest of the indices in this category (i.e. 0.206). The correlation coefficient in this particular case was worked out after ranking the sub-regions with North Blue Nile sub-region first and South Blue Nile and White Nile sub-regions second. The correlation in this case showed that households located in North Blue Nile sub-region tended to have more demand for total care than those located in South Blue Nile or White Nile sub-

TABLE 9 - 1

CORRELATION OF EXPLANATORY VARIABLES WITH TOTAL DEMAND FOR CURATIVE CARE.

Independent Variable			Correlation Coefficient
Component	Identification No.	Sub-components	
Predisposing Need		Need for Primary Care	.303
		Need for Intermediate Care	-
		Need for Secondary Care	-
Enabling Demographic Composition	i	Household size	-.039 ×
	ii	Household sex composition (% males)	.037 ×
		Household age structure:-	
	iii	% age group 1 year and below	-.019 ×
	iv	% age group 5 years and below	.010 ×
	v	% age group 17 years and below	-.001 ×
	vi	% age group 40 years and above	-.050
	vii	% age group 50 years and above	-.025 ×
	viii	% Females at child-bearing age	.051
Enabling Socio-economic structure	ix	Household income	.020 ×
	x	Occupation of main earner	.036 ×
		Household level of awareness:-	
	xi	Educational level of Head	.126
	xii	Educational level of Mother	.073
	xiii	Educational level of Oldest	.030 ×
	xiv	% children at school	.030 ×
Enabling Macro-environmental setting	xxiv	Sub-region (Ranked)	.206
	xxv	Residence (Ranked)	.076
		Curative environment:-	
	xxvi	General curative facilities	.125
	xxvii	Health centre or Maternity Clinic	.106
	xxviii	Special non-general hospital	.146
	xxix	Private clinic	.087
	xxx	Drugstore	.130
	xxxi	Local Healer (Osteopath)	.064
		Social welfare environment:-	
	xLiii	Regular health education	.090
	xLvi	Regular visits by health visitor	.095

TABLE 9 - 1

..CONTINUED

Independent Variable			Correlation Coefficient
Component	Identification No.	Sub-components	
Enabling Physical Accessibility	Li	Distance to nearest Primary Care Institution	-.062
	Lii	Distance to nearest Intermediate Care Institution	-.046
	Liii	Distance to nearest Secondary Care Institution	-.193
	Liv	Transport availability to nearest hospital	.120
	Lv	Journey time to nearest hospital	-.130

x Not significant at the .01 level.

- ve sign refers to inverse relationship.

- Not computed.

regions. The availability of a non-general hospital (0.146), a drugstore (0.130), a high level of general curative facilities (0.125), and a health centre (0.106), as enabling conditions showed comparatively high magnitudes of correlation with total demand. Households living in settlements where such facilities were available tended to have more total demand for curative care facilities than those living in settlements where such facilities were not available. On the other hand, indices within this component, like the availability of regular visits by health visitor (0.095), regular health education (0.090), a private clinic (0.087) or a local healer (0.064) and the type of the household residence (0.076) showed significant but comparatively lower magnitudes of correlation with total demand. Generally speaking, however, households living in settlements where such facilities were available and also where the settlement of residence was highly urbanized were shown to have more total demand for curative care facilities than those living in settlements without such facilities or where the settlement of residence was less urbanized.

The enabling physical accessibility component was next to the macro-environmental component in magnitude of correlation with total demand. Within this component, the distance to the nearest secondary care institution was the best predictor of total demand (i.e. - 0.193). The greater the distance between the household settlement of residence and a secondary care institution was, the lower the household's total demand for curative care facilities would be. Both indices of journey time to the nearest hospital (- 0.130) and the availability of transport to the nearest hospital (0.120) showed comparatively high magnitude of correlation with total demand. The greater the journey time to the nearest hospital was, the lower the household's total demand for curative facilities would be. Also, households residing in settlements where transport to the nearest hospital was available, tended to have more total demand for curative care facilities than those residing in settlements where no transport to the nearest hospital was available on regular basis.

Among the indices representing the enabling socio-economic structure, only the educational level of head of the household and that of the mother showed significant correlation with total demand. In both cases, the higher the educational level was, the greater the household's total demand for curative facilities would be. The educational level of the head of the household (0.126), however, was a better predictor than the educational level of the mother (0.073). All the other indices within this component were shown to be insignificantly correlated with total demand.

The magnitudes of correlation of the indices representing the enabling demographic component with total demand, except for percentage of females at child-bearing age (0.051) and the percentage of age group 40 years and above (0.050), were shown to be insignificant. The only two significant indices were even shown to have comparatively the lowest magnitudes of correlation among all the indices in the model. However, the findings reflect that households with high percentage of females at child-bearing age tended to have higher total demand than those with low percentage of such females. Also, the higher the percentage of members at 40 years and above was, the lower the total demand would be. Indices representing the household size (i.e. 0.039) and the household sex composition (i.e. 0.037) were shown to be just below the significance level.

Although the correlation analysis is constrained by predetermined assumptions of linearity and additivity normally inherent in any traditional regression analysis, the findings to a great extent supported the first two hypotheses of the need model outlined earlier. However, the A.I.D. analysis of variance which follows refines these findings and gives more specification to the relationships between the sub-components and their various indices in the model.

9.1.2 A.I.D. Analysis of Total Demand for Curative Care Facilities

The dependent variable in this A.I.D. analysis is the household's total demand. The potential predictors are all the 32 variables describing predisposing need component and the enabling demographic composition, socio-economic structure, macro-environmental and physical accessibility components. These variables which have already been assumed to influence demand, constitute the independent variables in this analysis.

Table 9 - 2 shows that, of the 32 possible predictors

TABLE 9 - 2

VARIANCE EXPLAINED IN A.I.D. ANALYSIS OF TOTAL DEMAND.

Identification No.	Predictor	Proportion of Variance Explained
	Predisposing Need for Curative Care	.170
-	Need for Primary Care	.072
-	Need for Intermediate Care	.005
-	Need for Secondary Care	.093
	Enabling Demographic Composition	.020
iv	% age group 5 years and below	.016
vii	% age group 50 years and above	.004
	Enabling Socio-economic Structure	.015
ix	Household Income	.001
x	Occupation of Main Earner	.008
xi	Educational Level of Head	.002
xiv	% Children at School	.004
	Enabling Macro-environmental Setting	.025
XXIV	Sub-region	.012
xxv	Residence	.002
xxvi	General Curative Facilities	.007
xLvi	Regular Visits by Health Visitor	.004
	Enabling Physical Accessibility	.116
Li	Distance to nearest Primary Care Institution	.022
Lii	Distance to nearest Intermediate Care Institution	.008
Liii	Distance to nearest Secondary Care Institution	.086
	R^2	.346

of demand included in this A.I.D. computer run, only 16 were actually used in the analysis.(1) Accordingly, these were found to be the best predictors of total demand for curative care institutions. The other 16 unused predictors were found to have either very negligible or no influence at all on total demand.

The results shown on Table 9 - 2 support the first two general hypotheses and substantiate the findings of the earlier correlation analysis. The predisposing need component and the enabling demographic composition, socio-economic structure, macro-environmental setting and physical accessibility components each contributes independently to the explanation of the differences in households' total demand for curative care facilities. Further, the proportion of variance explained by the need component was the largest (0.170). Contrary to the findings of the earlier correlation analysis, the enabling physical accessibility component, and not the enabling macro-environmental component, was next in order of importance to need. The proportion of variance explained by the physical accessibility (0.116) by far exceeded that explained by the macro-environmental component (0.025) which was third in order of importance. This indicated that the importance attributed to the macro-environmental variables in the correlation analysis could have been due merely to high intercorrelation of these variables with need rather than enabling conditions for

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(1) Detailed information on the selection of these variables is given in Table B - 5 in Appendix B.

demand. Furthermore, it was the enabling demographic composition (0.020), and not the socio-economic structure component (0.015) as suggested in the correlation analysis, which assumed the fourth place in importance in relation to total demand.

Among the variables representing the predisposing need component, all the sub-components of need were selected for use by the A.I.D. programme, indicating the importance of all types of need in explaining the differences in households' total demand. The effect of the secondary care need (0.093) was the greatest of all the need sub-components. The effect of primary care need (0.072) on total demand was next to secondary care need and nearly as high. But the effect of intermediate care need (0.005) was comparatively small and almost negligible. This is probably due to excessive demands for both secondary and primary care institutions as alternatives to intermediate care institutions.

Among the enabling physical accessibility sub-components, only the distance sub-component was selected for use by the A.I.D. programme. The other sub-components representing transport availability to nearest hospital and journey time were not selected for use, probably because they were highly intercorrelated with distance. All the variables representing the various distances were, however, selected. Again, the effect of distance to the nearest secondary care institution was the greatest (0.086). The effect of distance to the nearest primary care institution was next to that of distance to nearest secondary care institution, but represented only about a quarter of the proportion of variance explained by the latter (0.022). The effect of distance to the nearest intermediate care institution was also shown to be comparatively low (0.008) indicating that the location of such institutions in relation to the household was neither a great inducement nor a constraint to total demand for curative care institutions.

Almost all the sub-components of the enabling macro-environmental component were represented. The sub-region variable accounted for the highest proportion of variance explained within this category of variables (0.012). The general curative facility variable was next but it accounted for a comparatively low proportion of explained variance (0.007). None of the variables describing the availability of the additional curative facilities was selected. This indicated that the high associations between these variables and total demand in the earlier correlation analysis were merely the result of high intercorrelation with most important variables within this category. The social welfare environment was only represented by the variable describing the availability of regular visits by health visitors. The proportion of variance explained by this variable was comparatively very small (0.004). Health education did not show any effect on the extent of total demand. Residence was shown to have the lowest effect on total demand of all the selected variables in this category (0.002).

The enabling demographic composition component was only represented by the sub-component of the household age structure. Neither household size nor household sex composition was represented. This, to a certain degree, confirmed the findings of the earlier correlation analysis. However, the variables selected for use by the A.I.D. programme were not those that were shown to have the highest correlation coefficients. The variables describing the percentage of members 5 years and below and that of members 50 years and above were selected by the A.I.D. as enabling conditions to total demand. The effect of age group 5 years and below as reflected by the proportion of variance explained (0.016) was four times as great as that of age group 50 years and above (0.004).

The enabling socio-economic component, which was shown to have the least effect on total demand of all the other components of the model, was represented by almost all its sub-components. Each sub-component, however, accounted for a comparatively low proportion of explained variance. Household income accounted for only 0.001 of the variance explained. The variable describing the occupation of the head of household accounted for the greatest proportion of variance explained within this category of variables (0.008). The sub-component of household level of awareness was represented by the educational level of the head of household and by the percentage of children at school, both of which accounted for tiny proportions of the variance explained (0.002 and 0.004 respectively). Other indices of household level of awareness, i.e. educational level of mother and educational level of oldest member were shown to have no enabling influence on total demand for curative care facilities.

The Analytical Process

Table 9 - 2 shows the results of the A.I.D. analysis. However, it does not suggest the steps leading to the results nor does it indicate the interaction effects among the predictors. An examination of Figure 9 - 1 gives a more detailed view of the analytical process. Like the previous trees representing the A.I.D. processes of the need model, this figure shows:-

1. The splits taking place with the resulting classes of predictors in each sub-group;
2. The mean of each sub-group;
3. The number of households in each final group (N);
4. The adjusted percentage of households in each final group (P); and
5. The standard deviation (per 1,000 population) in each final group ($\bar{\sigma}$).

Twenty five splits were shown in the tree. These were ordered according to the unexplained variance which they accounted for at each step. The first group in the tree indicated the mean of the household total demand for curative care facilities in all the region (936.9 units /1,000). The rest of the tree showed which characteristics of the household were able to separate households with high total demands from those with low total demands.

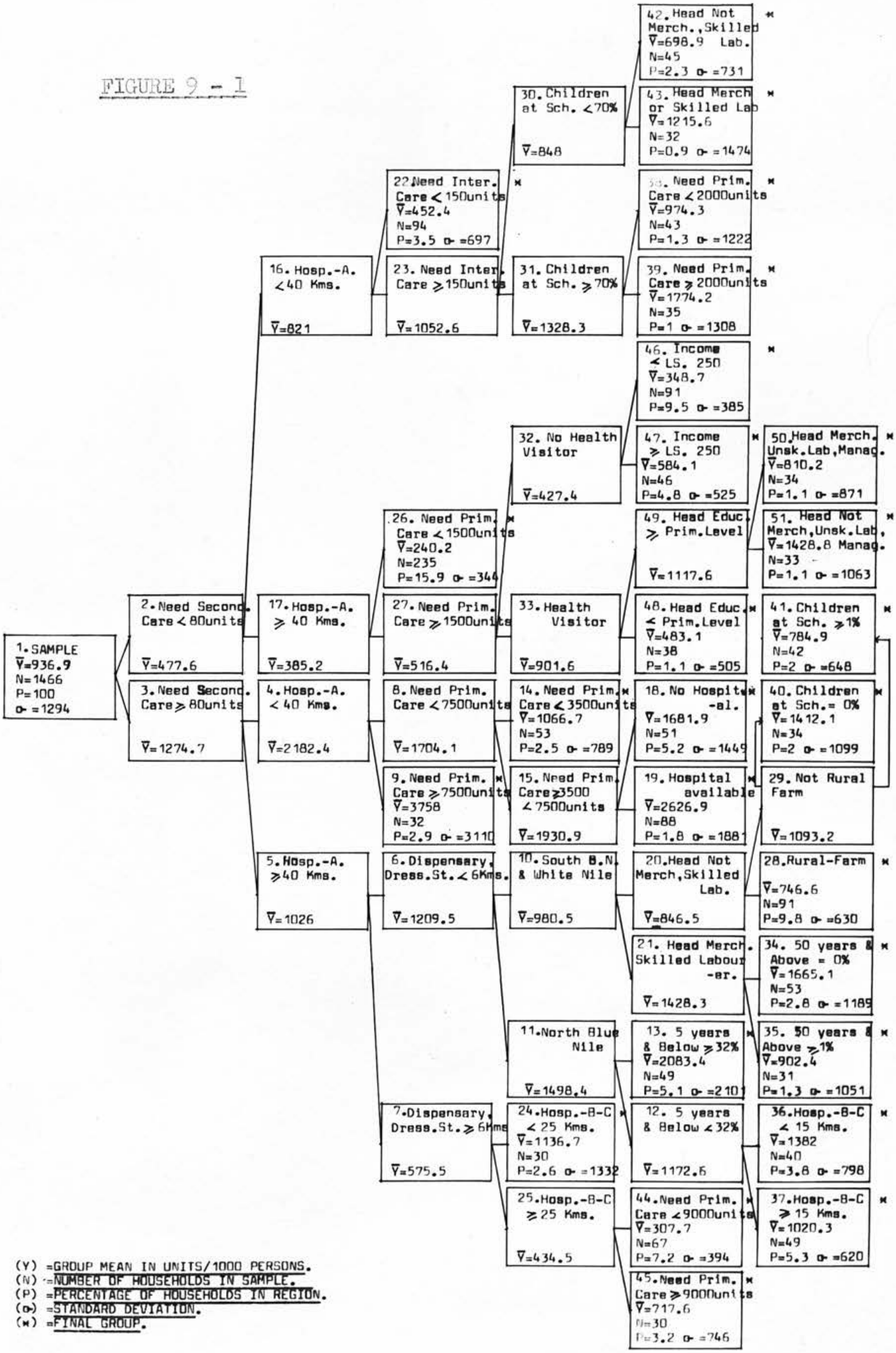
Need for secondary care provided the initial split. Households with low secondary care need of less than 80 units/ 1,000 (Group 2) had less total demands as indicated by their mean of 477.6 units/1,000 than those with high secondary care

FIGURE 9 - 1

PREDICTOR TREE FOR THE A.I.D. ANALYSIS OF TOTAL DEMAND FOR

CURATIVE CARE FACILITIES

FIGURE 9 - 1



(Y) = GROUP MEAN IN UNITS/1000 PERSONS.
(N) = NUMBER OF HOUSEHOLDS IN SAMPLE.
(P) = PERCENTAGE OF HOUSEHOLDS IN REGION.
(σ) = STANDARD DEVIATION.
(✱) = FINAL GROUP.

need of 80 units/1,000 or more (Group 3) with mean total demands amounting to 1,274.7 units/1,000.

The distance to the nearest Class A hospital accounted for the second best split on high secondary care need households (Group 3). Households located at less than 40 kilometres (Group 4) had more mean demands for curative care facilities, amounting to 2,182.4 units/1,000, than those located at 40 kilometres or more (Group 5) with mean total demands of 1,026 units/1,000.

The third split showed the importance of distance to nearest dispensary or dressing station on households located at distances of 40 kilometres or more from the nearest Class A hospitals (Group 5). Households where the distance to the nearest dispensary or dressing station was less than 6 kilometres (Group 6) had more mean total demands, amounting to 1,209.5 units/1,000, than those where the distance to the nearest dispensary or dressing station was 6 kilometres or more (Group 7) with mean total demands amounting to 575.5 units/1,000.

The fourth split showed the importance of primary care need on households located at less than 40 kilometres from the nearest Class A hospital (Group 4). Households whose need for primary care was less than 7,500 units/1,000 (Group 8) had less mean total demands, amounting to 1,704.1 units/1,000, than those whose need for primary care was 7,500 units or more (Group 9), with mean total demands amounting to 3,758 units/1,000.

The fifth split showed the importance of the sub-regional predictor on households residing in settlements where a dispensary or a dressing station was less than 6 kilometres (Group 6). Households in the South Blue Nile or White Nile sub-regions (Group 10) had less mean total demands, amounting to 980.5 units/1,000, than those in the North Blue Nile sub-region (Group 11) with mean total demands amounting to 1,498.4 units/1,000.

The sixth split showed the importance of the age group 5 years and below on North Blue Nile households (Group 11). Households where members in age group 5 years and below constituted a low percentage of less than 32 (Group 12) had less mean demands, amounting to 1,172.6 units/1,000, than those where members in this age group constituted a high percentage of 32 or more (Group 13) with mean total demands amounting to 2,083.4 units/1,000.

Need for primary care also accounted for the seventh split on households whose need for primary care was less than 7,500 units/1,000 (Group 8). Households whose need for primary care was less than 3,500 units/1,000 (Group 14) had less mean total demands, amounting to 1,066.7 units/1,000, than those whose need for primary care was between 3,500 and 7,499 units/1,000 inclusive (Group 15) with mean total demands amounting to 1,930.9 units/1,000.

Distance to Class A hospital also accounted for the eighth split on households whose need for secondary care was less than 80 units/1,000 (Group 2). Households where the nearest Class A hospital was located at less than 40 kilometres

(Group 16) had more mean total demands of 821 units/1,000 than those where the nearest Class A hospital was located at 40 kilometres or more (Group 17) with mean total demands amounting to 385.2 units/1,000.

The ninth split showed the importance of the availability of general curative facilities in settlements of residence on households whose need for primary care was between 3,500 and 7,499 units/1,000 (Group 15). Households where there was no hospital of any type (Group 18) had less mean total demands, amounting to 1,681.9 units/1,000, than those where there was a hospital of any type (Group 19) with mean total demands amounting to 2,626.9 units/1,000.

The tenth split showed the importance of the occupation of the head of household on households in the South Blue Nile or White Nile sub-regions (Group 10). Households whose heads had occupations other than merchants or skilled labourers (Group 20) had less mean total demands of 846.5 units/1,000, than those whose heads had occupations of merchants or skilled labourers (Group 21) with mean total demands amounting to 1,428.3 units/1,000.

The eleventh split showed the importance of need for intermediate care on households where the nearest Class A hospital was less than 40 kilometres and when need for secondary care was less than 80 units/1,000 (Group 16). Households whose need for intermediate care was less than 150 units/1,000 (Group 22) had less mean total demands of 452.4 units/1,000, than those whose need for intermediate care was 150 units/

1,000 or more (Group 23) with mean total demands amounting to 1,052.6 units/1,000.

The twelfth split showed the importance of distance to the nearest Class B or C hospital on households where a dispensary or dressing station was 6 kilometres or more away (Group 7). Households where the nearest Class B or C hospital was located at less than 25 kilometres (Group 24) had more mean total demands of 1,136.7 units/1,000 than those where the nearest Class B or C hospital was 25 kilometres or more (Group 25) with mean total demands amounting to 434.5 units/ 1,000.

Need for primary care also accounted for the thirteenth split on households where the nearest Class A hospital was 40 kilometres or more and when need for secondary care was less than 80 units/1,000 (Group 17). Households whose need for primary care was less than 1,500 units/1,000 (Group 26) had less mean total demands of 240.2 units/1,000 than those whose need for primary care was 1,500 units/1,000 or more (Group 27) with mean total demands amounting to 516.4 units/1,000.

The fourteenth split showed the importance of rural-urban residence on households whose heads had occupations other than merchants or skilled labourers (Group 20). Households residing in rural farm settlements (Group 28) had less mean total demands of 746.6 units/1,000 than those residing in any other settlement but rural farm (Group 29) with mean total demands amounting to 1,093.2 units/1,000.

The fifteenth split showed the importance of children at school on households whose need for intermediate care was 150 units/1,000 or more (Group 23). Households with less than 70% of their school-age children at school (Group 30) had less mean demands of 848 units/1,000 than those with 70% or more of their school-age children at school (Group 31) with mean total demands amounting to 1,328.3 units/1,000.

The sixteenth split showed the importance of the availability of regular visits by health visitors in settlements on households whose need for primary care was 1,500 units/1,000 or more (Group 27). Households in settlements where there was no regular visits by health visitors (Group 32) had less mean total demands of 427.4 units/1,000 than those where there were regular visits by health visitors (Group 33) with mean total demands amounting to 901.6 units/1,000.

The seventeenth split showed the importance of age group 50 years and above on households whose heads had occupations of merchants or skilled labourers (Group 21). Households where there was no member of the household in the age group 50 years and above (Group 34) had more mean total demands of 1,665.1 units/1,000 than those where there was at least one member of the household in the age group 50 years and above (Group 35) with mean total demands amounting to 902.4 units/1,000.

Distance to nearest Class B or C hospital also accounted for the eighteenth split on households where members in age group 5 years and below constituted less than 32% of the household (Group 12). Households where the nearest Class B or

C hospital was located at less than 15 kilometres (Group 36) had more mean total demands of 1,382 units/1,000 than those where the nearest Class B or C hospital was located at 15 kilometres or more (Group 37) with mean total demands amounting to 1,020.3 units/1,000.

Need for primary care also accounted for the nineteenth split on households with 70% or more of their school-age children at school (Group 31). Households with need for primary care less than 2,000 units/1,000 (Group 38) had less mean total demands of 974.3 units/1,000 than those with need for primary care 2,000 units/1,000 or more (Group 39) with mean total demands amounting to 1,774.2 units/1,000.

The predictor of children at school also accounted for the twentieth split on households residing in other than rural farm settlements (Group 29). Households where none of the school-age children were at school or where there were no school-age children in the household (Group 40) had more mean total demands of 1,412.1 units/1,000 than those where at least one of the school-age children was at school (Group 41) with mean total demands amounting to 784.9 units/1,000. In this particular case the household's awareness level as represented by the higher percentages of children at school indicated a constraint on excessive demands to curative care facilities, unlike the case in Group 31 where the level of awareness as represented by the same variable indicated an enabling effect to more demands.

The type of occupation the head of the household had also accounted for the twenty-first split on households with less than 70% of their school-age children at school (Group 30). Households whose heads had occupations other than merchants or skilled labourers (Group 42) had less mean total demands of 698.9 units/1,000 than those whose heads had the occupations of merchants or skilled labourers (Group 43) with mean demands amounting to 1,215.6 units/1,000.

Need for primary care also accounted for the twenty-second split on households where the nearest Class B or C hospital was located 25 kilometres or more away (Group 25). Households with need for primary care less than 9,000 units/1,000 (Group 44) had less mean total demands of 307.7 units/1,000 than those with need for primary care 9,000 units/1,000 or more (Group 45) with mean total demands amounting to 717.6 units/1,000.

The twenty-third split showed the importance of income as an enabling factor on households where there were no regular visits by health visitors in settlements of residence (Group 32). Households with incomes less than LS 250 (Group 46) had less mean total demands of 348.7 units/1,000 than those with incomes of LS 250 or more (Group 47) with mean total demands amounting to 584.1 units/1,000.

The twenty-fourth split showed the importance of the educational level of the head of household on households where there were regular visits by health visitors in settlements of residence (Group 33). Households whose heads had had no education or had only had nursery ("Khalwa") education (Group 48) had less mean total demands of 483.1 units/1,000 than those whose heads had had primary education or above that (Group 49) with mean total demands amounting to 1,117.6 units/1,000.

The type of occupation the heads of households had also accounted for the twenty-fifth and last split on households whose heads had had primary education or above that (Group 49). Households whose heads had occupations of merchants, unskilled labourers, professionals or managerial employees (Group 50) had less mean total demands of 810.2 units/1,000 than those whose heads had occupations other than those mentioned (Group 51) with mean total demands amounting to 1,428.8 units/1,000.

The ability of the A.I.D. programme to detect interaction effects was illustrated by this tree. It is worth noting that various combinations of predisposing need values and different enabling variables and variable values were used to differentiate those with high total demands for curative care facilities from those with low demands. Although the need variables seem to be dominant in the analysis, yet thirteen of the enabling variables were used each at least once. In particular, the predictor need for primary care was used five times; the predictor of occupation of head was used three times; the predictors of children at school, the distance to nearest Class A hospital and the distance to nearest Class B or C hospitals were each used twice. However, the primacy of the predictor of need for secondary care in differentiating high demands households from low demands households should not be overlooked.

By itself, need for secondary care accounted for about 27% of the total variance explained by the demand model. Predictors of the distance to nearest Class B or C hospital, the distance to nearest dispensary or dressing station, sub-region, rural-urban residence, percentage of members in age group 5 years and below and percentage of members in age group 50 years and above were used only in cases when need for secondary care was more than 80 units/1,000 but not less. This value of need for secondary care could be considered as a threshold for the relevance of these enabling predictors in influencing the extent of total demand for curative care facilities. On the other hand, predictors like household income, the availability of regular visits by health visitors, educational level of head of household and need for intermediate care were used only when need for secondary care was less than 80 units/1,000 but not more. This value of need for secondary care, again, could be considered as a threshold for the non-relevance of these enabling conditions in influencing the extent of total demands for curative care facilities.

Table 9 - 3 gives a summary of the final prediction groups in the A.I.D. analysis of households' total demands for curative care facilities. It should be pointed out that the various combinations of predisposition need factors together with the enabling situational factors were reasons why the resulting demands for curative facilities came to be what they were. The table shows that 38.3% of the households in the region had total demands above the average value for the whole

region where-as 61.7% of the households in the region had total demands below the average of the whole region. Even if needs for curative care were assumed to be equal (which was not the case as revealed by the earlier need model) variation in demands would reflect an unequitable distribution of curative care resources.

The degree of precision in predicting total demands for curative care facilities with the sixteen selected predictors, can be judged from the low proportions of unexplained variance still remaining in each final group. With the exception of Groups 9 and 13, where the proportions of unexplained variance within the group was 0.167 and 0.134 respectively, this proportion for each of the remaining groups was not greater than 0.065. The lowest was 0.005 for Groups 41 and 50. These very low proportions of unexplained variance indicated that the A.I.D. programme was able to produce a very high degree of precision in predictability of total demands employing certain predisposing need components together with enabling demographic composition, socio-economic structure, and macro-environmental setting and physical accessibility components.

TABLE 9 - 3

CHARACTERISTICS OF FINAL GROUPS IN A.I.D. ANALYSIS OF TOTAL DEMAND FOR CURATIVE FACILITIES AS MEASURED BY THE COST EQUIVALENT OF A VISIT.

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
9	32	2.9	3 758.0	0.167	Secondary care need $\geq$80 units/1000; Hospital A $<$ 40kms; Primary care need $\geq$7500 units/1000.
19	88	1.8	2 626.9	0.039	Secondary care need $\geq$ 80 units/1000; Hospital A $<$ 40kms; Primary care need $\geq$3500 $<$ 7500 units/1000; Any type of hospital available.
13	49	5.1	2 083.4	0.134	Secondary care need $\geq$80 units/1000; Hospital A $\geq$ 40kms; Dispensary or Dressing station $<$ 6kms; In North Blue Nile; 5 years and below $\geq$32%.

TABLE 9 - 3

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) ×	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
39	35	1.0	1 774.2	0.011	Secondary care need $<$80 units/1000; Hospital A $<$40kms; Intermediate care need $\geq$150 units/1000; Children at school $\geq$70%; Primary care need $\geq$2000 units/1000.
18	51	5.2	1 681.9	0.065	Secondary care need $\geq$80 units/1000; Hospital A $<$40kms; Primary care need $\geq$3500 $<$7500 units/1000; No hospital available.
34	53	2.8	1 665.1	0.024	Secondary care need $\geq$80 units/1000; Hospital A $\geq$40kms; Dispensary or Dressing station $<$ 6kms; In South Blue Nile or White Nile; Occupation of Head: Merchant or skilled labourer; No member 50 years and above.

TABLE 9 - 3

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P/ x	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
51	33	1.1	1 428.8	0.007	Secondary care need $<$ 80units/1000; Hospital A $\geq$ 40kms; Primary care need $\geq$ 1500 units/1000; Health visitor in home; Head educated above nursery or "Khalwa" level; Occupation of Head: Other than merchant, unskilled labourer or professional or managerial employee.
40	34	2.0	1 412.1	0.014	Secondary care need $\geq$ 80units/1000; Hospital A $\geq$ 40kms; Dispensary or Dressing Station $<$ 6kms; In South Blue Nile or White Nile; Occupation of Head: Other than merchant or skilled labourer; In other than rural farm; No children at school.

TABLE 9 - 3

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
36	40	3.8	1 382.0	0.015	Secondary care need $\geq$ 80units/1000; Hospital A $\geq$ 40kms; Dispensary or Dressing Station $<$ 6kms; In North Blue Nile; 5 years and below $<$ 32%; Hospital B or C $<$ 15kms.
43	32	0.9	1 215.6	0.012	Secondary care need $<$ 80units/1000; Hospital A $<$ 40kms; Intermediate care need $\geq$ 150 units/1000; Children at school $<$ 70%; Occupation of Head: Merchant or skilled labourer.

TABLE 9 - 3

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
24	30	2.6	1 136.7	0.028	Secondary care need ≥ 80units/1000; Hospital A ≥ 40kms; Dispensary or Dressing station ≥ 6kms; Hospital B or C < 25kms.
14	53	2.5	1 066.7	0.009	Secondary care need ≥ 80units/1000; Hospital A < 40kms; Primary care need < 3500 units/1000;
37	49	5.3	1 020.3	0.012	Secondary care need ≥ 80units/1000; Hospital A ≥ 40kms; Dispensary or Dressing station < 6kms; In North Blue Nile; 5 years and below < 32%; Hospital B or C ≥ 15kms.

TABLE 9 - 3

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
38	43	1.3	974.3	0.012	Secondary care need < 80units/1000; Hospital A < 40kms; Intermediate care need ≥ 150units/1000; Children at school ≥ 70%; Primary care need < 2000units/1000.
35	31	1.3	902.4	0.008	Secondary care need ≥ 80units/1000; Hospital A ≥ 40kms; Dispensary or Dressing station < 6kms; In South Blue Nile or White Nile; Occupation of Head: Merchant or skilled labourer; At least one member 50 years and above.

TABLE 9 - 3

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) ×	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
50	34	1.1	810.2	0.005	Secondary care need < 80units/1000; Hospital A ≥ 40kms; Primary care need ≥ 1500units/1000; Health visitor in home; Head educated above nursery or "Khalwa" level; Occupation of Head: Merchant or unskilled labourer or professional or managerial employee.
41	42	2.0	784.9	0.005	Secondary care need ≥ 80units/1000; Hospital A ≥ 40kms; Dispensary or Dressing station < 6kms; In South Blue Nile or White Nile; Occupation of Head: Other than merchant or skilled labourer; In other than rural farm; At least one child at school.

TABLE 9 - 3

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
28	91	9.8	746.6	0.023	Secondary care need ≥ 80units/1000; Hospital A ≥ 40kms; Dispensary or Dressing station < 6kms; In South Blue Nile or White Nile; Occupation of Head: Other than merchant or skilled labourer; In rural farm.
45	30	3.2	717.6	0.011	Secondary care need ≥ 80units/1000; Hospital A ≥ 40kms; Dispensary or Dressing station ≥ 6kms; Hospital B or C ≥ 25kms; Primary care need ≥ 9000units/1000.

TABLE 9 - 3

..CONTINUED

(1)

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$	Characteristics of Households in Group
42	45	2.3	698.9	0.007	Secondary care need < 80units/1000; Hospital A < 40kms; Intermediate care need ≥ 150units/1000; Children at school < 70%; Occupation of Head: Other than merchant or skilled labourer.
47	46	4.8	584.1	0.008	Secondary care need < 80units/1000; Hospital A ≥ 40kms; Primary care need ≥ 1500units/1000; No health visitor in home; Income ≥ LS 250.

TABLE 9 - 3

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) x	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
48	38	1.1	483.1	0.002	Secondary care need $<$ 80units/1000; Hospital A $\geq$ 40kms; Primary care need $\geq$ 1500units/1000; Health visitor in home; Head either not educated or only up to nursery or "Khalwa" level.
22	94	3.5	452.4	0.010	Secondary care need $<$ 80units/1000; Hospital A $\geq$ 40kms; Intermediate care need $<$ 150units/1000.
46	91	9.5	348.7	0.008	Secondary care need $<$ 80units/1000; Hospital A $\geq$ 40kms; Primary care need $\geq$ 1500units/1000; No health visitor in home; Income $<$ LS 250.

TABLE 9 - 3

..CONTINUED

Final Group No.	No. of households in sample (N)	Per cent of households in region (P) ×	Mean of Total Demand per 1000 members ($\bar{Y}$)	Unexplained variance in Group (Proportion) $(TSS)_i/(TSS)_T$ (1)	Characteristics of Households in Group
44	67	7.2	307.7	0.007	Secondary care need ≥ 80units/1000; Hospital A ≥ 40kms; Dispensary or Dressing station ≥ 6kms; Primary care need < 9000units/1000; Hospital B or C ≥ 25kms.
26	235	15.9	240.2	0.011	Secondary care need < 80units/1000; Hospital A ≥ 40kms; Primary care need < 1500units/1000.

Mean of Total Demand for all households in the region = 936.9units/1000.

× Total does not add up to 100% due to rounding up error.

(1) Unexplained variance in Group refers to the variance within the Group still not accounted for as a proportion of the total unexplained variance in the sample $(TSS)_i/(TSS)_T$ gives the proportion for Group (i).

9.2.0 DEMAND FOR VARIOUS TYPES OF CURATIVE CARE INSTITUTIONS

Although the total demand analysis conducted in the previous section showed why and how households in the region differed in their total use of curative care facilities, it did not reflect clearly why certain types of curative facilities were being used more than others. Separate analyses of demand for primary, intermediate and secondary care institutions are presented in this section in order to discover why and how these differences occur. Such findings will reveal to what extent certain types of curative care institutions are more equitably provided than others. They will also point to the kind of planning action needed in order to make each type more equitably delivered. A household's demand for each type of curative care institutions is measured by the number of visits made to each type of institutions during the survey year as discussed in Chapter 7.

9.2.1 Correlation Analysis of Demand for Various Types of Curative Care Institutions

The results of the correlation analysis for each of the three types of demand are given in Table 9 - 4. These results show the following in relation to the different types of demand:-

I. Demand for Primary Care Institutions

As expected, a household's demand for this type of curative care institutions tended to be more highly correlated

TABLE 9 - 4

CORRELATION OF EXPLANATORY VARIABLES WITH DEMAND FOR VARIOUS TYPES OF CURATIVE CARE INSTITUTIONS.

Independent Variables			Correlation Coefficient		
			Type of Demand		
Component	Identification No.	Sub-component	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
Predis-posing Need	-	Need for Primary Care	.405	.117	.131
	-	Need for Intermediate Care	-	-	-
	-	Need for Secondary Care	-	-	-
Enabling Demographic Composition	i	Household Size	-.100	-.033 ×	.020 ×
	ii	Household Sex Composition	.052	-.007 ×	.033 ×
		Household Age Structure:-			
	iii	% 1 year and below	-.014 ×	.012 ×	-.026 ×
	iv	% 5 years and below	.111	.031 ×	-.055
	v	% 17 years and below	.070	-.019 ×	-.013 ×
	vi	% 40 years and above	-.121	-.018 ×	-.002 ×
	vii	% 50 years and above	-.080	-.017 ×	.013 ×
	viii	% females at child-bearing age	.063	.009 ×	.034 ×

TABLE 9 - 4

..CONTINUED

Independent Variables			Correlation Coefficient		
			Type of Demand		
Component	Identification No.	Sub-component	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
Enabling Socio-Economic Structure	ix	Household Income	-.173	-.019 x	.109
	x	Occupation of Main Earner	.083	.010 x	.004 x
		Household level of Awareness:-			
	xi	Educational level of Head	-.017 x	.087	.101
	xii	Educational level of Mother	-.077	.078	.067
	xiii	Educational level of Oldest	.030 x	.001 x	.024 x
	xiv	% children at school	-.098	-.040	.113
Enabling Macro-Environmental Setting	xxiv	Sub-region (Ranked)	-.082	-.142	.334
	xxv	Residence (Ranked)	-.358	.153	.130
		Curative environment:-			
	xxvi	General curative facilities	-.328	.107	.213
	xxvii	Health Centre or Maternity Clinic	-.340	.177	.143
	xxviii	Special Non-General Hospital	-.188	-.146	.367
	xxix	Private Clinic	-.364	.161	.141
	xxx	Drugstore	-.333	.107	.220

TABLE 9 - 4

..CONTINUED

Independent Variables			Correlation Coefficient		
			Type of Demand		
Component	Identification No.	Sub-component	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
	xxxi	Local Healer (Osteopath)	-.168	.091	.084
		Social Welfare Environment:-			
	xLiii	Regular Health Education	-.260	.018 ×	.206
	xLvi	Regular visits by health visitor	-.306	.105	.166
Enabling Physical Accessibility	Li	Distance to nearest Primary Care Institution	-.166	.155	-.124
	Lii	Distance to nearest Intermediate Care Institution	.187	-.340	.116
	Liii	Distance to nearest Secondary Care Institution	.014 ×	.112	-.329
	Liv	Transport availability to nearest hospital	-.232	.144	.141
	Lv	Journey time to nearest hospital	.173	-.157	-.118

× Not significant at the 0.01 level. - ve sign refers to inverse association. - Not cumputed.

with the predisposing component than with any of the variables representing the various enabling components. The household's need for primary care was shown to have the strongest relationship with demand for primary care institutions (i.e. 0.405). Households whose need was high tended to be high demanders for this type of institutions.

Among the enabling components of the model, the macro-environmental component was next in magnitude of correlation with this type of demand. In particular, such variables as the availability of a private clinic (- 0.364), the type of residence (- 0.358), the availability of health centre or maternity clinic (- 0.340), the availability of a drugstore (- 0.333), the type of general curative facilities available (- 0.328), regular visits by health visitors (- 0.306) and regular health education (- 0.260) showed sizable correlations. However, the remaining variables within this component were shown to be significantly associated with demand for primary care institutions. Households where such facilities were not available or where high level of general curative facilities were not available or which resided in urban settlements, had the highest demands for primary care institutions.

The enabling physical accessibility component was next in order of magnitude of correlation. In particular, the variable describing the availability of regular transport to nearest hospital showed the strongest association (- 0.232). Households where regular transport facilities to the nearest hospital were available had lower demands for these types of institutions than those where regular transport facilities were not available. Other variables within this category such as the distance to the nearest intermediate care institution (0.187), the journey time to the nearest hospital (0.173) and the distance to the nearest primary care institution (- 0.166) also showed significant correlations. Only the variable describing the distance to the nearest secondary care institution was shown to be insignificantly associated with demand for primary care institutions. Households which were located farthest away from the nearest intermediate care institution or those where the journey time to the nearest hospital was highest had the highest demand for primary care institutions. Moreover, households which lived furthest away from the nearest primary care institution tended to have low demand for these types of institutions.

Within the enabling socio-economic component, only household income showed any sizable correlation with demand (- 0.173). High income households tended to have lower demands for this type of institutions than low income households. Other variables within this category, such as percentage of children at school (- 0.098), occupation of main earner (0.083) and educational level of mother (- 0.077), showed significant but comparatively low magnitudes of correlation. Educational level of head and that of the oldest member were shown to be insignificantly associated with this type of demand.

Within the enabling demographic composition component, the variable describing the percentage of members in age group

40 years and above (- 0.121), that describing the percentage of members in age group 5 years and below (0.111) and that of household size (- 0.100) showed adequate correlations. In general, households where the percentage of members in age group 40 years and above was low, where the percentage of members in age group 5 years and below was high, or where the household size was small tended to have high demands for primary care institutions. The remaining variables within this component, except for percentage of members in age group 1 year and below, were shown to be significant, but of comparatively low magnitudes of correlation.

II. Demand for Intermediate Care Institutions

Also, as expected, a household's demand for intermediate care institutions tended to be more highly correlated with the enabling components than with the predisposing need component. Among the enabling components, the physical accessibility component had the strongest association with this type of demand. In particular, the distance to the nearest intermediate care institution was shown to have the highest magnitude of correlation with this type of demand (- 0.340). The nearer the households to an intermediate care institution were, the greater the demand for intermediate care institutions would be. All the remaining variables within this component were shown to have sizable correlation coefficients. Households where the journey time to the nearest hospital was low, or where the distance to the nearest primary care institution was high, or where transport facilities to the nearest hospital were available or where the distance to the nearest secondary care institution was high, tended to have high demands for intermediate care institutions.

The enabling macro-environmental component was next in order of magnitude of correlation with demand for intermediate care institutions. Almost all the variables within this component showed significant associations with demand. The only exception was the health education variable. The availability of a local healer ("Faki") showed significant but comparatively low association with this type of demand (0.091). The highest correlation was with the availability of a health centre or a maternity clinic (0.177). Households where a health centre or maternity clinic was available tended to have high demand for intermediate care institutions. Among the high demanding households for these types of curative institutions were those where a private clinic was available (0.161), those which resided in more urbanized settlements (0.153), those where a special non-general hospital was not available (- 0.146), those which resided in South Blue Nile or White Nile rather than North Blue Nile (- 0.142), those where a drugstore or a high level of general curative care facilities was available (0.107) and those where there were regular visits by health visitors (0.105).

The predisposing need component was shown to be third in magnitude of correlation with demand for intermediate care institutions. Need was represented only by the primary care need in this case (0.117). The higher the household's need for primary care was, the higher the demand for intermediate care would be.

Both the enabling socio-economic structure and the demographic composition components did not reflect any sizable association with demand for intermediate care institutions. Among the socio-economic structure variables, only the educational level of the household head (0.087) and the educational level of mother (0.078) showed significant correlations. All the demographic composition variables had insignificant correlations with this type of demand.

III. Demand for Secondary Care Institutions

Also, as expected, a household's demand for secondary care institutions tended to be more highly correlated with the enabling components than with the predisposing need component. Rather unexpectedly, the enabling macro-environmental component rather than the physical accessibility component was the one which had the strongest association with this type of demand. The availability of a special non-general hospital had the highest magnitude of correlation with demand for secondary care institutions (0.367). Households which resided in settlements where a special non-general hospital was available, tended to have the highest demand for this type of curative institution. Apart from the availability of a local healer ("Faki") which had significant but comparatively low correlation coefficient (0.084), all the variables within the macro-environmental component had sizable magnitudes of correlation. In particular, the variable describing the type of sub-region showed a comparatively high association with this type of demand (0.334). Households which resided in North Blue Nile had more demands for secondary care institutions than those which resided in either South Blue Nile or White Nile sub-regions. Generally, high demanding households for this type of institution were those where a drugstore was available (0.220), those where a high level of general curative facilities was available (0.213), those where there was regular health education (0.206), those where there were regular visits by health visitors (0.166), those where a health centre or a maternity clinic was available (0.143), those where a private clinic was available (0.141) and those which resided in more urbanized settlements (0.130).

The enabling physical accessibility component was next in order of magnitude of correlation with demand for secondary care institutions. All the variables in this category had sizable correlation coefficients. The distance to the nearest secondary care institution had the highest association with this type of demand (i.e. - 0.329). The nearer a household to a secondary care institution was, the higher its demand for it would be. Generally, high demanding households for this type of institution tended to be those where regular transport facilities to the nearest hospital were available (0.141), those where the distance to the nearest primary care institution was small (- 0.124), those where the journey time to the nearest hospital was low (- 0.118) and those where the distance to the nearest intermediate care institution was large (0.116).

The predisposing need component was third in order of magnitude of correlation with demand for secondary care institutions. Only the need for primary care was computed in this case (0.131). The higher the household's need for primary care was, the greater its demand for secondary care institutions would be.

Among the variables representing the enabling socio-economic structure component, only the percentage of children at school (0.113), household income (0.109) and the educational level of the household head showed adequate association with demand for secondary care institutions. The high demanding households were those where the percentage of children at school was high, those where the household income was high and those where the educational level of the household head was also high. The educational level of the mother, on the other hand, was shown to be significantly associated with this type of demand but had comparatively low magnitude of correlation (0.067). The variable describing the occupation of the main earner and that describing the educational level of the oldest member of the household were shown to be insignificantly correlated with this type of demand.

Among the variables representing the enabling demographic composition component, only that describing the percentage of members in age group 5 years and below was shown to be significantly associated with demand for secondary care institutions (- 0.055). All the other variables were shown to have insignificant correlation coefficients.

These findings generally support the third and fourth hypotheses of the demand model. Although comparisons of the correlation coefficients from one type of demand to another suggested some relevant basic relationships, the A.I.D. analysis which follows will provide more definite evidence. The magnitudes of the correlation coefficients in the analysis of demand for primary care institutions seemed to be generally greater than in the analysis of either demand for intermediate or secondary care institutions. This might, in a more general way, suggest that the general demand model was more successful in explaining demand for primary care institutions than explaining the demands for either intermediate or secondary care institutions. Such evidence still will have to be supported more conclusively by the forthcoming A.I.D. analysis.

9.2.2 A.I.D. Analysis of Demand for Various Types of Curative Institutions

A.I.D. analyses of household demand for primary, intermediate and secondary care institutions were performed. Thirty-one of the variables outlined in the demand model were included in each analysis as possible predictors. The household's demands for primary, intermeidate and secondary care institutions were each included as the dependent variable in each analysis. The measure for each dependent variable was the number of visits made to the respective curative institutions by the household (per 1,000 members) during the survey year as discussed in Chapter 7.

Table 9 - 5 indicates which of the explanatory vari-

TABLE 9 - 5

VARIANCE EXPLAINED IN A.I.D. ANALYSES OF DEMAND FOR PRIMARY, INTERMEDIATE AND SECONDARY CARE INSTITUTIONS.

Predictor	Proportion of Total Variance in Demand Explained		
	Type of Demand		
	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
Predisposing Need for Curative Care	0.202	0.071	0.139
Need for Primary Care	0.202	-	-
Need for Intermediate Care	-	0.071	-
Need for Secondary Care	-	-	0.139
Enabling Demographic Composition	0.013	0.040	0.009
Household Size	-	0.008	-
Household Sex Composition	-	-	0.008
Household Age Structure:-			
% age group 1 year and below	-	-	-
% age group 5 years and below	-	0.028	-
% age group 17 years and below	0.005	-	0.001
% age group 40 years and above	0.008	0.004	-
% age group 50 years and above	-	-	-
% females at child-bearing age	-	-	-

TABLE 9 - 5

..CONTINUED

Predictor	Proportion of Total Variance in Demand Explained		
	Type of Demand		
	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
Enabling Socio-economic Structure	0.000	0.008	0.003
Household Income	-	0.008	-
Occupation of Main Earner	-	-	0.003
Household Level of Awareness:-			
Educational Level of Head	-	-	-
Educational Level of Mother	-	-	-
Educational Level of Oldest	-	-	-
% children at school	-	-	-
Enabling Macro-environmental Setting	0.124	0.159	0.029
Sub-region	0.027	-	0.005
Residence	-	-	0.001
Type of Nearest Hospital	-	0.006	-
General Curative Facilities	0.097	0.152	0.023
Health Centre or Maternity Clinic	-	-	-
Special Non-general Hospital	-	-	-

TABLE 9 - 5

..CONTINUED

Predictor	Proportion of Total Variance in Demand Explained		
	Type of Demand		
	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
Continued... Enabling Macro-environmental Setting			
Private Clinic	-	-	-
Drugstore	-	-	-
Local Healer (Osteopath)	-	0.001	-
Regular Health Education	-	-	-
Regular Visits by Health Visitor	-	-	-
Enabling Physical Accessibility	0.048	0.069	0.182
Distance to nearest Primary Care Institution	0.002	-	-
Distance to nearest Intermediate Care Institution	0.032	0.029	0.006
Distance to nearest Secondary Care Institution	0.014	0.040	0.176
Transport Availability to nearest Hospital	-	-	-
Journey time to nearest Hospital	-	-	-
Total Variance Explained	0.387	0.347	0.362

- refers to predictors not used in relevant A.I.D. analysis.

ables were selected by the A.I.D. programme in the analysis of each type of demand. In addition, the proportions of the total variance in demand accounted for by each component of the model and its respective variables are given. The table shows that eight variables were used in the analysis of demand for primary care institutions, ten variables were used in the case of demand for intermediate care institutions, and nine variables were used in the case of demand for secondary care institutions.(1) Further, it shows that, in the case of demand for intermediate and secondary care, each of the components of the model contributed independently to the explanation of the total variance. In the case of demand for primary care, all but the socio-economic structure component contributed to the explanation. The variable describing the availability of general curative facilities, that describing the distance to the nearest intermediate care institution and that describing the distance to the nearest secondary care institution were used in all the three analyses. On the other hand, the variable describing the percentage of members in age group 40 years and above was employed by the A.I.D. programme only in the analyses of demand for primary and intermediate care institutions. The variable describing the percentage of members in age group 17 years and below and that describing the type of sub-region were employed only in the analyses of demand for primary and secondary care institutions.

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(1) Detailed information on the selection of these variables is given in Tables B - 6, B - 7 and B - 8 in Appendix B.

In order to verify both hypotheses III and IV of the general demand model, the relative and the absolute contributions of the components are discussed below:-

A. The Relative Contribution of the Components

Table 9 - 6 shows the relative contribution of the components and their respective sub-components for each type of demand. The findings generally support hypothesis III. That is, that the predisposing need component (need for primary care) is the most important component in the case of demand for primary care institutions, accounting for over half of the explained variance (52.2%). Moreover, the enabling socio-economic component did not account for any of the explained variance in this case (0.0%). But the enabling macro-environmental component was second in order of importance to the need component. It accounted for a bit under one third of the total explained variance (32%). The curative environment and the sub-region were the only relevant sub-components within this component. The relative contribution of curative environment sub-component (25%), however, was over three times that of the sub-regional sub-component (7%). Neither residence nor social welfare sub-components had any influence on demand for primary care. The enabling physical accessibility component was third in order of importance accounting for well over one tenth of explained variance (12.4%). Within this component only the distance sub-component was relevant. Neither transport availability to the nearest hospital nor journey time accounted for any variance. The enabling demographic component was represen-

TABLE 9 - 6

PER CENT OF EXPLAINED VARIANCE ATTRIBUTED TO COMPONENTS AND RESPECTIVE SUB-COMPONENTS FOR EACH TYPE OF DEMAND.

Component (Sub-component)	Per cent of Total Explained Variance		
	Type of Demand		
	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
Predisposing Need for Care	52.2	20.5	38.4
Need for Primary Care	52.2	-	-
Need for Intermediate Care	-	20.5	-
Need for Secondary Care	-	-	38.4
Enabling Demographic Composition	3.4	11.5	2.5
Household Size	-	2.3	-
Household Sex Composition	-	-	2.2
Household Age Structure	3.4	9.2	0.3
Enabling Socio-economic Structure	0.0	2.3	0.8
Household Income	-	2.3	-
Occupation of Main Earner	-	-	0.8
Household Level of Awareness	-	-	-

TABLE 9 - 6

..CONTINUED

Component (Sub-component)	Per cent of Total Explained Variance — Type of Demand		
	Demand for Primary Care Institutions	Demand for Intermediate Care Institutions	Demand for Secondary Care Institutions
Enabling Macro-environmental Setting	32.0	45.8	8.0
Sub-region	7.0	-	1.4
Residence	-	-	0.3
Curative Environment	25.0	45.8	6.3
Social Welfare Environment	-	-	-
Enabling Physical Accessibility	12.4	19.9	50.3
Distance to Curative Institutions	12.4	19.9	50.3
Transport availability to nearest Hospital	-	-	-
Journey time to nearest Hospital	-	-	-
Total	100.0	100.0	100.0

- Sub-component accounted for no variance.

ted only by the household age structure sub-component which had only limited influence on this type of demand, accounting for 3.4% of the total explained variance.

The prediction that the enabling components rather than the predisposing component would play the most important role in the cases of demand for intermediate and secondary care institutions is substantiated. The enabling components together accounted for 79.5% of the total variance explained in the case of intermediate care demand and 61.6% of the total variance explained in the case of secondary care demand. In the case of demand for intermediate care institutions, the enabling macro-environmental component was shown to be the most important of all the components in the model, accounting for 45.8% of the explained variance. Only the curative environment sub-component was relevant within this component. However, the predisposing need component (need for intermediate care) was next in importance but accounting for much less than half the variance explained by the enabling macro-environmental component (20.5%). The enabling physical accessibility component, as only represented by the sub-component of distance to nearest curative institution, was also shown to be nearly as important as the predisposing need component, accounting for 19.9% of the total explained variance. The enabling demographic composition component was fourth in order of importance accounting for well over one tenth of the total variance (11.5%). Household age structure (9.2%) and household size (2.3%) were the only relevant sub-components within this component. Household sex composition did not contribute to the total variance explained. The enabling socio-economic component was represented only by household income, but offered the least contribution to the explanation of demand for intermediate care institutions (2.3%).

In the case of demand for secondary care institutions, the enabling physical accessibility component was shown to be the most important of all the components in the model, accounting for just over half the total explained variance (50.3%). The distance to the nearest curative institution was the only relevant sub-component within this component. The predisposing need component (need for secondary care) was second in order of importance, accounting for 38.4% of the total explained variance. The enabling macro-environmental component was third in order of importance but accounting for nearly one fifth of the variance explained by need (8%). It is worth noting that, apart from the social welfare environment, all the sub-components within this component shared in the explanation of variance. Curative environment accounted for the greatest explained variance within this category (6.3%). Both sub-region and residence contributed comparatively little to the variance explained within this category. The enabling demographic composition component offered only limited contribution to the total explained variance (2.5%), shared between the household sex composition (2.2%) and the household age structure sub-components (0.3%). The enabling socio-economic component, like in the previous cases, offered the least contribution to explanation of demand for secondary care institutions (0.8%). The occupation of the main earner was the only relevant sub-component within this category.

It should be noted that, with regard to demand for intermediate care institutions, no one component accounted for over half of the explained variance. Demand for primary care institutions was primarily explained by the predisposing need component, while demand for secondary care institutions was primarily explained by the enabling physical accessibility component. Details regarding each of these analyses can be found in the description of the analytical processes which follow:-

I. Demand for Primary Care Institutions

The predictor tree showing how these predictors explained demand for primary care institutions appears in Figure 9 - 2. Nineteen splits were performed during the analysis using only eight of the thirty-two possible predictors. Only need for primary care was introduced to represent the predisposing component. The first group indicated the mean primary care demand for all the households in the region (2,604.8 visits/ 1,000).

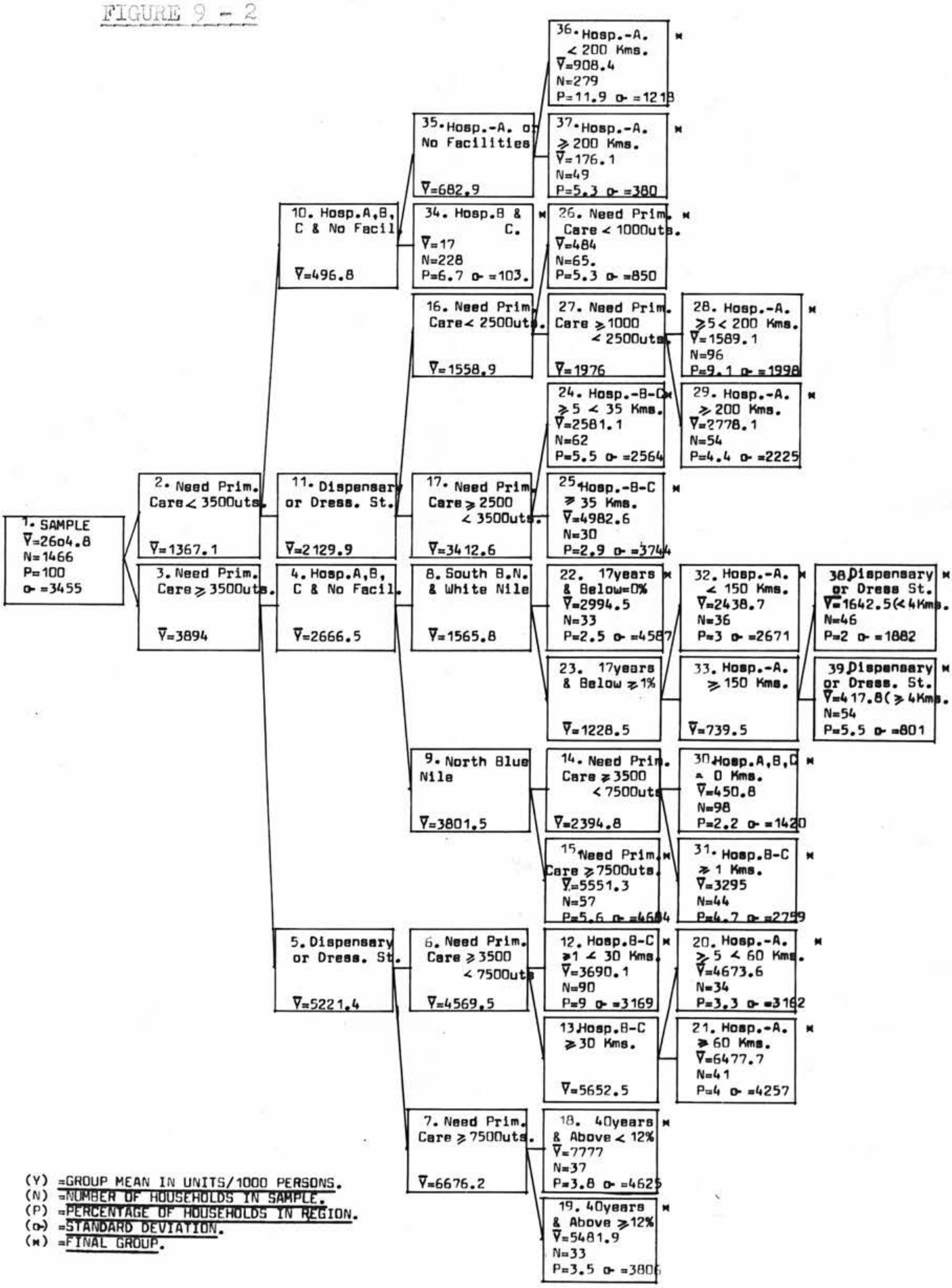
The first split indicated the importance of need for primary care. Households with low needs below 3,500 units/ 1,000 (Group 2) had less mean demands of 1,367.1 visits/1,000 than those with high needs of 3,500 units/1,000 or more (Group 3) with mean demands amounting to 3,894 visits/1,000.

The second split indicated the importance of the type of general curative facilities available on highly needy households (Group 3). Households where either a Class A, B or C hos-

FIGURE 9 - 2

PREDICTOR TREE FOR THE A.I.D. ANALYSIS OF DEMAND FOR PRIMARY CARE INSTITUTION

FIGURE 9 - 2



(Y) =GROUP MEAN IN UNITS/1000 PERSONS.
(N) =NUMBER OF HOUSEHOLDS IN SAMPLE.
(P) =PERCENTAGE OF HOUSEHOLDS IN REGION.
(σ) =STANDARD DEVIATION.
(*) =FINAL GROUP.

pital or no facilities were available (Group 4) had less demand for primary care institutions, with mean demands amounting to 2,666.5 visits/1,000, than those where a dispensary or a dressing station was available (Group 5) with mean demands amounting to 5,221.4 visits/1,000.

Need for primary care also accounted for the third split on households where a dispensary or a dressing station was available (Group 5). Households with low needs of between 3,500 and 7,499 units/1,000 inclusive (Group 6) had less demand for primary care institutions, with mean demands amounting to 4,569.5 visits/1,000, than those with high needs of 7,500 units/1,000 or more (Group 7) with mean demands amounting to 6,676.4 visits/1,000.

The fourth split indicated the importance of the subregion on households where a Class A, B or C hospital or no facilities were available (Group 4). Households in South Blue Nile or White Nile sub-regions (Group 8) had less demand for primary care institutions, with means of 1,565.8 visits/1,000, than those in North Blue Nile (Group 9) with mean demands amounting to 3,801.5 visits/1,000.

The type of general curative facilities available also accounted for the fifth split on households with low needs of less than 3,500 units/1,000 (Group 2). Households where either a Class A, B or C hospital or no facilities were available (Group 10) had less demand for primary care institutions, with means of 496.8 visits/1,000, than those where a dispensary or a dressing station was available (Group 11) with mean demands amounting to 2,129.9 visits/1,000.

The sixth split indicated the importance of distance to the nearest Class B or C hospital on households with needs for primary care of 3,500 - 7,499 units/1,000 (Group 6). Households located at less than 30 kilometres from the nearest Class B or C hospital (Group 12) had less demand for primary care institutions, with means of 3,690.1 visits/1,000, than those located at 30 kilometres or more from the nearest Class B or C hospital (Group 13) with mean demands amounting to 5,652.5 visits/1,000.

Need for primary care also accounted for the seventh split on households in North Blue Nile (Group 9). Households with needs for primary care of between 3,500 and 7,499 units/1,000 inclusive (Group 14) had less demand for primary care institutions, with means of 2,394.8 visits/1,000, than those with needs of 7,500 units/1,000 or more (Group 15) with mean demands amounting to 5,551.3 visits/1,000.

Need for primary care also accounted for the eighth split on households where a dispensary or a dressing station was available (Group 11). Households with needs for primary care of less than 2,500 units/1,000 (Group 16) had less demand for primary care institutions, with means of 1,558.9 visits/1,000, than those with needs of between 2,500 and 3,499 units/1,000 (Group 17) with mean demands amounting to 3,412.6 visits/1.000.

The ninth split indicated the importance of the age group 40 years and above on households with high needs of

7,500 units/1,000 or more (Group 7). Households where members in the age group 40 years and above constituted less than 12% of the household members (Group 18) had more demand for primary care institutions, with means of 7,777 visits/1,000, than those where such members constituted 12% or more of the household members (Group 19) with mean demands amounting to 5,481.9 visits/1,000.

The tenth split indicated the importance of the distance to the nearest Class A hospital on households where the distance to the nearest Class B or C hospital was 30 kilometres or more (Group 13). Households located at less than 60 kilometres from the nearest Class A hospital (Group 20) had less demand for primary care institutions, with means of 4,673.6 visits/1,000, than those located at 60 kilometres or more from the nearest Class A hospital (Group 21) with mean demands amounting to 6,477.7 visits/1,000.

The elventh split indicated the importance of the age group 17 years and below on households in the South Blue Nile or White Nile sub-regions (Group 8). Households where none of the household members was in the age group 17 years and below (Group 22) had more demand for primary care institutions, with means of 2,994.5 visits/1,000, than those where at least one household member was in the age group 17 years and below (Group 23) with mean demands amounting to 1,228.5 visits/1,000.

The distance to the nearest Class B or C hospital also accounted for the twelfth split on households with needs for primary care of 2,500 - 3,499 units/1,000 (Group 17).

Households located at less than 35 kilometres from the nearest Class B or C hospital (Group 24) had less demand for primary care institutions, with means of 2,581.1 visits/1,000, than those located at 35 kilometres or more (Group 25) with mean demands amounting to 4,982.6 visits/1,000.

Need for primary care also accounted for the thirteenth split on households with needs for primary care of less than 2,500 units/1,000 (Group 16). Households with needs for primary care of less than 1,000 units/1,000 (Group 26) had less demand for primary care institutions, with means of 484 visits/1,000, than those with needs for primary care of between 1,000 and 2,499 units/1,000 (Group 27) with mean demands amounting to 1,976 visits/1,000.

The distance to the nearest Class A hospital also accounted for the fourteenth split on households with needs for primary care of between 1,000 and 2,499 units/1,000 (Group 27). Households located at less than 200 kilometres from the nearest Class A hospital (Group 28) had less demand for primary care institutions, with means of 1,589.1 visits/1,000, than those located at 200 kilometres or more from the nearest Class A hospital (Group 29) with mean demands amounting to 2,778.1 visits/1,000.

The distance to the nearest Class B or C hospital also accounted for the fifteenth split on households with needs for primary care of 3,500 - 7,499 units/1,000 inclusive (Group 14). Households where a Class A, B or C hospital was located at no distance (Group 30) had less demand for primary care institutions, with means of 450.8 visits/1,000, than those where a Class B or C hospital was located at any distance over 1 kilometre (Group 31) with mean demands amounting to 3,295 visits/1,000.

The distance to the nearest Class A hospital also accounted for the sixteenth split on households where at least one member of the household was in the age group 17 years and below (Group 23). Households located at less than 150 kilometres from the nearest Class A hospital (Group 32) had more demand for primary care institutions, with means of 2,438.7 visits/1,000, than those located at 150 kilometres or more from the nearest Class A hospital (Group 33) with mean demands amounting to 739.5 visits/1,000.

The type of general curative facilities available also accounted for the seventeenth split on households where either a Class A, B or C hospital or no facilities were available (Group 10). Households where a Class B or C hospital was available (Group 34) had less demand for primary care institutions, with means of only 17 visits/1,000, than those where either a Class A hospital or no facilities were available (Group 35) with mean demands amounting to 682.9 visits/1,000.

The distance to the nearest Class A hospital also accounted for the eighteenth split on households where either a Class A hospital or no facilities were available (Group 35). Households located at less than 200 kilometres from the nearest Class A hospital (Group 36) had more demands for primary care institutions, with means of 908.4 visits/1,000, than those located at 200 kilometres or more from the nearest Class A hospital (Group 37) with mean demands amounting to 176.1 visits/1,000.

The nineteenth and last split indicated the importance of distance to the nearest dispensary or dressing station on households where the nearest Class A hospital was located at 150 kilometres or more (Group 33). Households located at less than 4 kilometres from the nearest dispensary or dressing station (Group 38) had more demand for primary care institutions, with means of 1,642.5 visits/1,000, than those located at 4 kilometres or more from the nearest dispensary or dressing station (Group 39) with mean demands amounting to 417.8 visits/1,000.

The foregoing analytical process reflected the dominant effect of the need predictor on demand for primary care institutions. This predictor, in addition to its primacy in the splitting process, was employed four times in differentiating high demand from low demand households. The effect of the magnitude of need on the extent of demand was consistent, but, at various stages in the analysis, different ranges of need were used to indicate the differentiations in demand. The predictor of distance to the nearest Class A hospital was also dominant in the analysis as it was employed four times to differentiate high demand from low demand households. But its effect was not consistent throughout the analysis. In two stages a larger distance from the nearest Class A hospital indicated greater demands for primary care institutions, while in the